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THE BULLETIN OF
THE GEOGRAPHICAL SOCIETY
OF PHILADELPHIA

VOLUME XVI

JANUARY-OCTOBER, 1918

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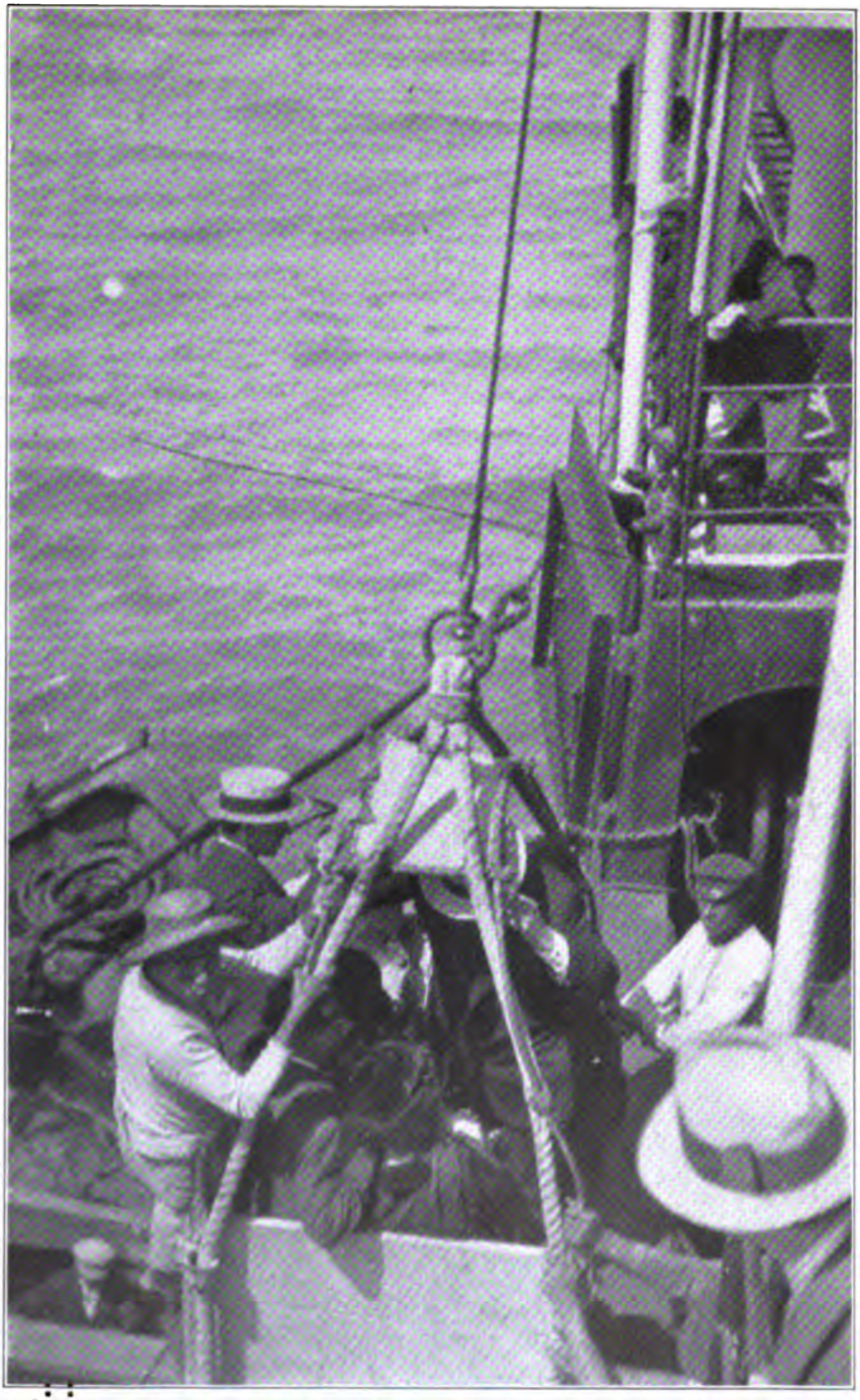


Passengers Embarking on the *Mantaro*, West Coast of Peru.

FROM MOLLENDO TO LA PAZ VIA CUZCO.

CASUAL OBSERVATIONS MADE ON A TRIP IN THE DAYS PRECEDING THE OUTBREAK OF THE WAR.

HUNTINGTON WILSON,

FORMERLY ASSISTANT SECRETARY OF STATE, ETC.

[Where the coast of South America turns north at the southern boundary of Ecuador the cold Humboldt current keeps the coast's immediately previous northwestern direction and flows on out to the Galapagos Islands. Going south after the hot greenery of the Ecuadorian coast one follows a desolate drab shore line all the way down to Chile and beyond. These notes begin at Chala.]

AREQUIPA, PERU, July 11, 1914,
On board car.

Chala is this! The utterly barren drab coast swings out to a point of dark rocks of sealbrown color. Within this hook a line of rocks upon which the heavy surf is thrown into spray as it rolls in upon a narrow beach. Above there rises the usual long windswept rim of sand forming a grim palisade, and above this, in ungainly shapes, sand dunes rise into hills, far beyond which are seen the grim sierras. Above the first rampart of sand are a few scattered buildings, a straggly looking church, apparently of wood painted gray. Off to the left, among the dunes, one sees the windswept graveyard grimy with sand, and straggling buildings come to the beach in a narrow place where there is a small pier. There is a fairly smart rowboat with the Peruvian flag, a number of other rowboats, and the usual group of barges swaying at anchor. Some of these come out to send on board huge round baskets covered with burlap and containing oranges, grown either in a watered coast oasis hidden by the sand dunes, or perhaps in a low sierra valley, from which they are brought laboriously upon mules and donkeys. There were also put on board several hundred sheep and goats—fairly good ones. They were lying with their feet tied together panting in the bottoms of the barges and boats, and were thrown pellmell into big rope nets, in which a dozen or more were carried aboard, their feet cut loose and pushed struggling into the pens on board. One unfortunate sheep got his head caught in the rail of the barge, and due to a roll of the ship was brought up minus that important member. We ran straight for the rocks and anchored incredibly near the spray, arriving at Chala at about 1.20 P. M. We got away at 4.30 P. M. and continued along this monotonous coast, getting to Mollendo the morning of the 9th.

Mollendo is another Chala, with bigger rocks extending further around from the point of the hook. In the rocks a trough-like narrow place has been made into which cargo and passengers are taken in boats or launches to be landed. There is a stairway—la escala—incredibly near the surf-dashed rocks, but we went into the slip and were hoisted in a chair by a steam derrick, which one mounts, nicely timing the boat's upwards and downwards shoots as the surf rolls in. The tracks of the Ferrocarriles del Sur come right to this slip, and by the station a cobbled incline leads up into the town, which has rather a mining camp appearance, built, even to the church, of painted boards. It seems there are four or five thousand (?) people and about forty foreigners. The place derives its importance from the fact that it is the shipping point for the wool and alpaca for which Arequipa is the *entrepot,* as well as the port of import for a tremendous region—and also is used by Bolivia as a port of import and export more than is Arica or Antofagasta. Even here is the usual plaza, this time paved with flags and grown with carefully planted and fostered palm trees, with some flowers. The plaza habit and the care with which these places of popular consolation are maintained are among the commendable things in these countries.

At 12.35 P. M. our train started. The road led for several miles right along the beach, about two or three hundred yards from where the surf broke, and flanked most of the way by an ugly wall of sand-covered conglomerate material, from which here and there a huge chunk lay isolated on the sandy beach, this wall marking the beating of the waves a while ago and being, but for an occasional dried-up weed and curious domelike patches of evergreen looking stuff (even it killed in spots by the sad conditions), quite barren.

After perhaps some eight or ten miles of this we turned inland and struggled up through the sand dunes, which soon turned into formidable hills, barren (but for a sparse sprinkling of particularly weedy looking weeds, all dead) and growing in their surface more and more covered with broken rock rotted by the air, as they turned from gray to reddish and rose from hills to mountains. In a sort of oasis of a very few square miles we stopped at a shabby and desolate little village called Ensenada—dirt and dust and adobe and planking and cobble stones and frowzy, dirty people, and a few trees like eucalyptus bravely struggling. As we rose we could see to the North a beautiful floor of green, like a jewel in a mournful setting, open to a fan-shaped width of two or three miles by the sea, and wedging itself, narrowing upwards for half a dozen miles or so between these hopeless barren mountains. As we rose still higher we could see the line of the surf, and beyond the blue strip of the sea merging into a blue-gray wall of mist lying over the Humboldt current. This wall of mist ended so abruptly and had such a straight line against the blue sky that it was almost difficult not to believe that *it,* and not the black-blue edge below, was the horizon. After this, almost always rising, we came to two vast deserts, with only a rim of sand dunes to mark, as we looked back, the higher level reached. In the first of these, even as it began, we passed a village, if one may so call a water tank, a few shabby houses, and three or four heroic trees. The water here must be like artesian. The second and larger desert is called La Joya. Along there we saw great numbers of the curious crescent-shaped dunes of gray sand, conspicuous against the disordered yellow surface marked with stones, and with sides blown into infinite tiny ripples like the surface of a lake. This desert took on an orange tint, and in the distance on our right the lumpy mountains were maroon color, marked with rifts of white of some salts. Beyond these, ahead of us, we saw the top of Misti with the true white of snow, with less regular, but snow-touched, mountains to the right and left of it. Always rising, the country would stretch out in a vast valley of hummocks and mountain shapes, worn as if by water, but probably in this rainless country by the drift of wind and sand. It gave one a detached vision of a glance at the world's surface stretched out before one's eyes. Finally, as we skirted a deep chasm where the rocky surface was varied by bulging dome-like formations of dark or yellow sand, far down the cliffs of pinkish yellow rock we saw a strip of glorious green and the silver thread of a tiny stream. This stream conceals itself somehow until it waters the miniature valley, which broadens as it approaches the Pacific. Here and there the valley would widen to the extent of a few hundred yards, and was well cultivated with alfalfa, grains, potatoes, etc. This is the Chili River, which we met at Arequipa. On the way we saw a number of adobe villages, very tiny, and built on the barren hill in order not to waste a foot of arable land. A few miles before reaching Arequipa is the intake for the electric power. Then comes Tingo, where the valley is fairly wide, a suburb connected by trolley, and then a few minutes later the electric lights of Arequipa, where we arrived at 6.10 P. M. (7,594 feet above the sea).

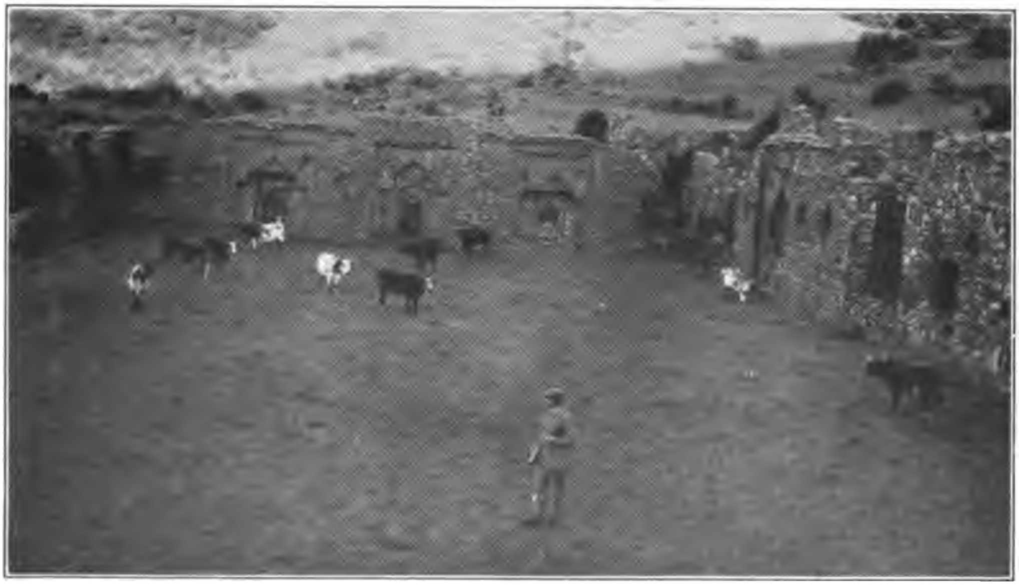
JULIACA, PERU, July 12, 1914, 6.35 P. M.,
On the train.

The car was attached to a freight, which then consisted of two box cars, one flat car, and this one, and left at four o'clock this morning. This was done because the passenger train of five cars, leaving at 7.30 o'clock, could not pull this additional one up the steep grades to Pillones (14,330 feet), where they picked us up, after half an hour's wait, at about 1.30 P. M. I got up about six o'clock, when it grew light, and watched the scenery all day, but now it seems a blur of infinite tumbling mountains and plateaus arid and desolate. We came 304 kilometers today; it was 172 kilometers from Mollendo to Arequipa, and it will be 337.5 kilometers from here to Cuzco. These distances bring home to one the vastness of the Andean plateau in this its widest neighborhood near the Peruvian-Bolivian frontier. The first thing this morning the country was yellow and barren, a vast confusion of insignificant cone-shaped hummocks, with higher mountains in the far distance. By infinite curves we gradually wound our way in half a dozen hours around to the back of Misti and the other two snow-tuoched mountains we had seen back of Arequipa, but now we could see upon them scarcely any snow, because this was the northern or sunny side. About 35 kilometers on the way there appeared a tiny rivulet of

The Strait on Lake Titicaca, with the Island of the Sun to the Left, and the Island of the Moon in the Center.

The Steamship *Yapura* near the Island of the Sun, on Lake Titicaca, Bolivia.

The Inca Pleasure Garden on the Island of the Sun, Lake Titicaca.



The Ruins on the Island of the Moon, Lake Titicaca.

water in a deep yellow quebrada. At times it would descend a steep incline entirely hidden in a crack not more than a yard wide at the top. Even this bit of water made first a tiny green strip and then perhaps a hundred acres of alfalfa, etc., where there was a small hacienda with animals, etc. This was the only sign of life until far on we met with the llamas and alpacas and sheep. In our rise we encountered several doleful plateaus. At first the formation was yellow material, containing small gravel, which in the cuts was cut as neatly as cheese. Later it became rocky and at times there were very curious brown formations worn into rounded shapes as if by erosion. At other times the hills were crowned with dark jagged rock. Sometimes there was grayish stone with apparently granite bowlders. After a while there were tufts of coarse yellow grass. Later, when the alpacas began to appear, there were yellow patches of short grass apparently with seed tops. Where the best of the pasture came, this same style of patchy growth continued, in some places apparently with a very fine short yellow grass in spots between. The animals were few and there were practically no habitations except the few huts about the creditably neat stations and water tanks. We were fortunate in seeing several small herds of vicuñas, a graceful antelope-like animal, the fur of which makes very beautiful rugs.

After passing Crucero Alto (14,751 feet), the highest point, a dozen miles brought us to Lagunillas, where a beautiful lake came in view. We skirted this and then discovered another, blue under the sky, and came down and ran along the beach until we descended at its lower end with a tiny creek, then left it, passing a bleak adobe village with a church. We passed Santa Lucia and two other points—almost literally points—until our little stream had grown bigger and led us into an enormous flat valley, like the bottom of a former lake, hedged in by mountains. At Cabanillas (12,820 feet) there was actually a tree, the first of the day, a good many Indians and in fact a village. Just before had begun evidences of ancient terracing on the hillsides and one saw some grain fields. Doubtless the fact that something to eat was produced gave this pathetic village an appearance almost of bustle after what we had been through. Beginning in the neighborhood of the lakes the flocks of alpacas and llamas were much larger and more numerous, and a good many sheep were to be seen. Now this huge flat surface mostly affords indifferent grazing, but is scratched in many places. Some of the terraces are still in use. From that one would judge that in Inca times the whole flat was under grain as well as the terraces. The soil here was black, the river affording means of irrigation, apparently now but very indifferently availed of. As the train sped along this sad valley we noticed many adobe hovels with their adobe-walled yards, their few animals, and a few Indians standing listless as the train went by. From the northeast there were gathering clouds of threatening appearance, and at sunset the aspect of this country was one of poignant sadness. The Peruvians would better conserve their mountain Indians, for they will hardly induce any other people ever to live in this desolate land of cold and dust and of lack of food and of vast toilsome distances.

We got to Juliaca (12,622 feet) almost on time, a little after 5.30 P. M., and I immediately went for a walk. Behind the station is a cobble-paved plaza with a windmill in the middle, and long low buildings with balconies and a squat church facing it, and two hotels, the botica, etc. Near the windmill the military band was playing rather well. At the station were swarms of Indian women. In the plaza a dozen or so were seated selling wares. All were filthy, all were ugly, and all had their faces distorted with big quids of coca. Some of the streets have drains in the center. All have one-story buildings, their interiors being dark, shallow, cell-like holes in the wall. Other streets are unpaved. The wind and dust are frightful. We walked out to a rather handsome church built with a dome, and adorned with many spires resembling Italian candelabra, and giving it a sort of style. In the whole place there was not a tree or a blade of grass, dust and disorder and dirt and ruin and neglect everywhere.

I was particularly interested in seeing this pasture country, which, by the way, in the best and highest places, has plenty of water besides the lakes in the form of a sort of seepage, seemingly from the snow mountains far away, and even east of Crucero Alto there was a river, probably the rivulet I first saw, which appeared for a time of a dignity to require a bridge. Even the dry country back there seemed to have been worn in gullies and gulches, but water had evidently little or no force, for often the track's embankment would interrupt such a dry channel without even the necessity of a way through for it.

At this point I may insert a correction of yesterday's dictation. A Texan in charge of the railway office at Arequipa told me that on this whole line there were no artesian wells; that all the water was piped and carried by gravity to the innumerable water tanks, except for a few places high up where it was pumped, in one case, here, I think, by this windmill. He told me, too, that the Chili River that flows through Arequipa rose in the neighboring snow mountains, and flowed down (as we saw it), and then went north of Mollendo, where it irrigated a valley to the coast. The pretty valley we saw leaving Mollendo was that of the Tambo.

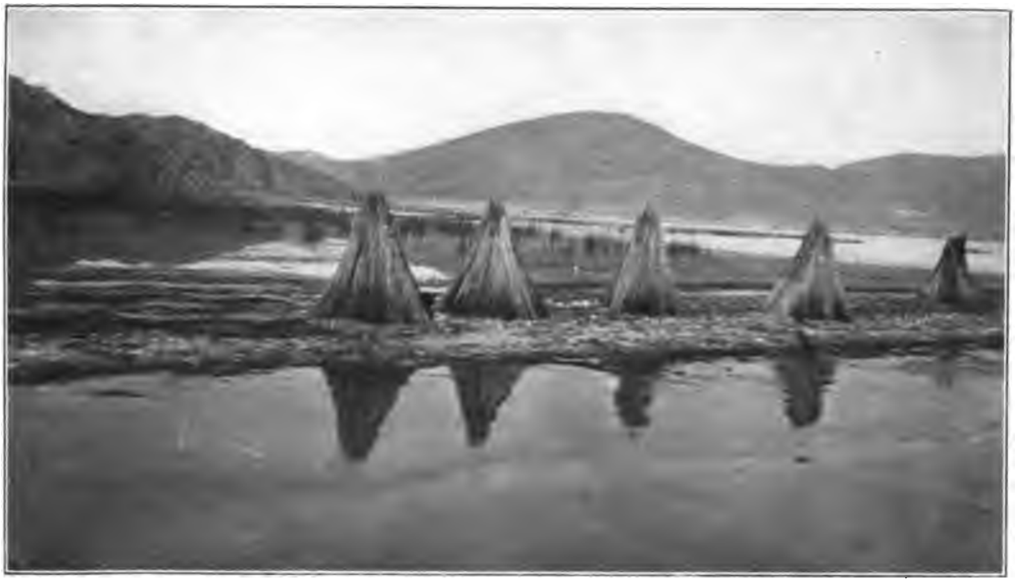
To resume, I was glad to see the sheep and alpacas and llamas and vicuñas. It seems that classifying, washing, compressing and packing wool is the chief industry of Arequipa, and supports three or four German and one or two English houses, which also, as importers, deal in general merchandise. The German colony is the largest, the English next, there being possibly 200 foreigners in Arequipa, not counting a very large number of "Turcos." These are presumably Armenians. It seems they undersold and drove out the Chinese, and now have in their hands most of the retail trade. There are one good Japanese house and several "peluqueria Japonesa." There are very few Americans, Grace & Co., having only a couple of young Peruvians and an American wool man, who is only now beginning to put them into that trade. There is a branch of the German Bank, the Bank of London and Peru, and also an Italian bank. The foreign firms buy the wool, just as, indeed, British firms like Duncan, Fox and Company and others buy the cotton crops from the Peruvian haciendados, advancing them money at different stages, and paying them a certain percentage of any advance on a fixed price at which the foreign firm may ultimately sell this cotton in the world's markets.

The cathedral is at Arequipa, beautiful outside with its yellow stone, its odd columns, and two symmetrical towers. It has great dignity, and the two arches with iron gratings which join the façade to the front wall of the enclosure are of a tininess suggesting a pretty church in Europe rather than the ponderous Spanish-Colonial style. The plaza is large and well planted, and surrounded by colonnades of one story only, as is most of the city since an earthquake forty years ago destroyed so much. The aspect of the streets is a sort of compromise between Lima and the shabbier parts of Quito. On the way back from the Harvard Observatory we got a wonderful view of the pink and blue and white city of Arequipa gleaming under a red-golden glow of sunset, which was very beautiful against a sky varying from a Lucca de la Robia blue through the gamut to a delicate turquoise tint. This, with the green eucalyptus, and the irrigated fields, and Misti and the other mountains in the background, made a wonderful picture. The city itself seemed at a distance as one imagines Jerusalem must have looked.

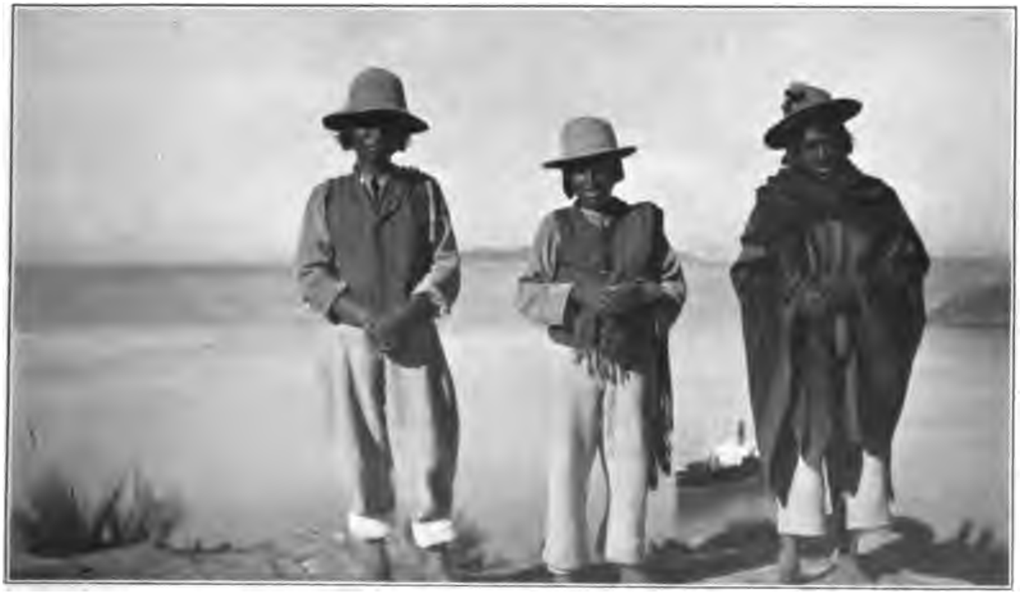
ON SS. YAPURA, LAKE TITICACA, July 17, 1914.

Our first afternoon in Arequipa we went to the Harvard Observatory in a ramshackle old Studebaker motor driven by a cholo with the invariable small boy along, over a quite exceptionally vile road. At first we had to turn right angles in streets so narrow that one wheel had to go on the sidewalk, the while passing donkeys, llamas and sheep as we plowed our way through the filth beneath and the evil-smelling atmosphere. Emerging from the town, it was a steep grade of loose sand spread with large rocks. Arrived, we were entertained with magic-lantern pictures, some of stars, but most of other subjects more suited to our childlike ignorance of astronomy. Then we had inspection of the photographic telescopes, with elaborate explanations. It seems they have taken 50,000 plates in making the history of the heavens in connection with the Cambridge University for the last twenty to thirty years. The observer in charge spoke especially of variable stars, whose periods of brilliancy and of disappearance, due probably to eclipse by their companions, were being calculated to fractions of seconds. The ones which really disappeared for good after a final brilliancy were quite exceptional. This Observatory has wireless communication with the Yale Expedition, who are making a map of the country beyond Cuzco.

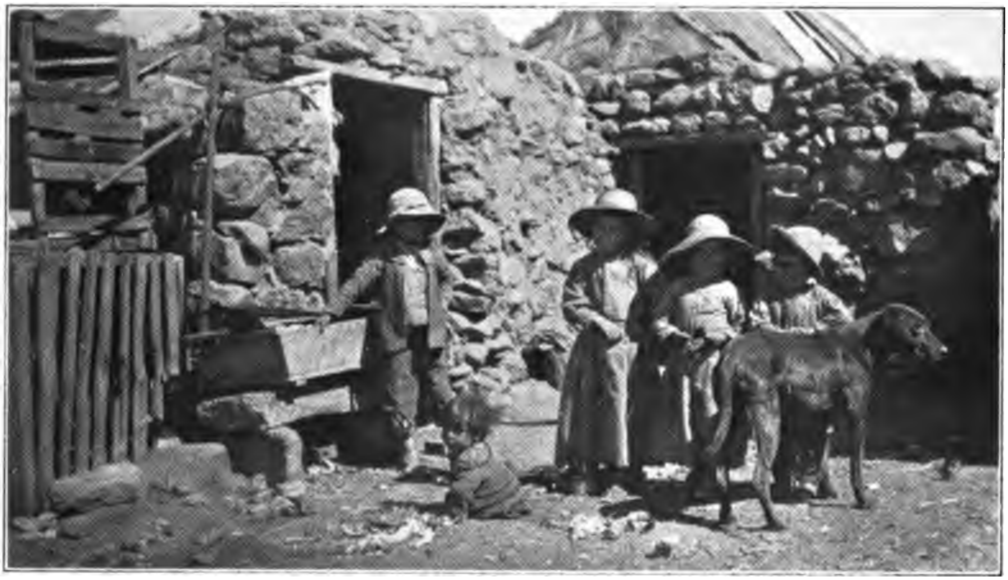
The Arequipa Hospital is reputed one of the best in South America. There are three hundred beds, always full, Roman Catholic sisters for nurses, a free ward, and an extremely inadequate medical staff. The buildings are good and fairly clean.



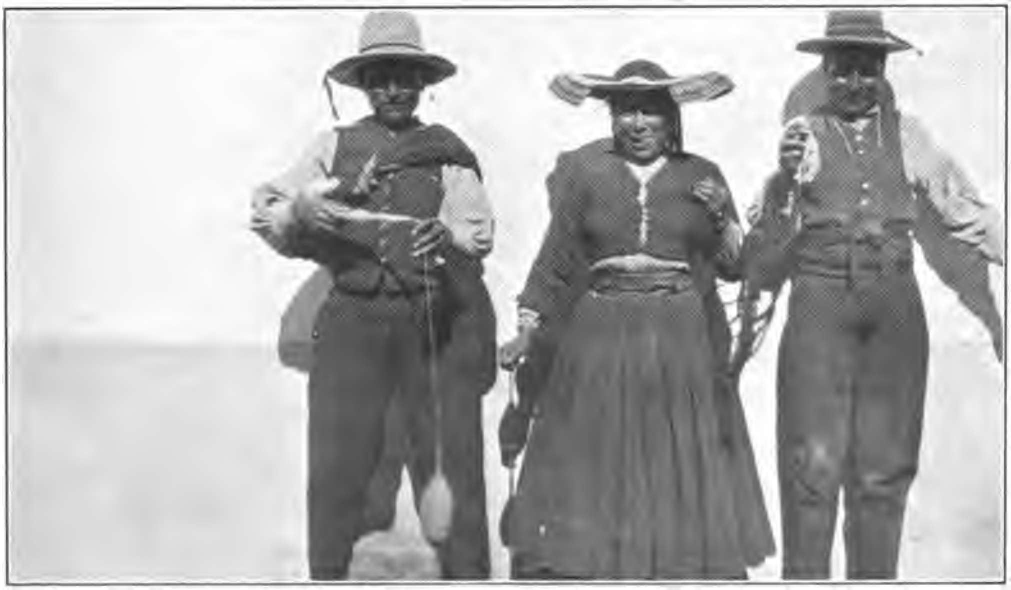
Marshy Part of Lake Titicaca near Puno, with Reeds Drying to be Used Later in the Construction of Balsas.



Type of Indians on the Island of the Sun, Lake Titicaca.



Group Taken at Pampa de Arrieros, between Arequipa and Juliaca, Peru.



Types at Combapta, Peru, between Cuzco and Juliaca.

Arequipa has good trolley lines and electric light. The street cars were built in the United States. There is also an Empresa Urbana de Transportes, which runs big Studebaker wagons drawn by four mules. There is a German brewery, as usual.

The population of Arequipa appears about 30,000. I suppose the town, doubtless a former Indian village, was populated by Spaniards who had come from the North via Cuzco. A good many of the houses are dated a hundred years or more back. Some have armorial bearings, and a good many have religious insignias with IHS over the door. Practically the whole town is built of a light, whitish volcanic stone, most of the houses being plastered and kalsomined in blues, pinks, etc. The roofs are flat, and those of the better class are built likewise of stone, arched inside. Those of the poorer houses run to a sort of thatch, plastered over with mud into a rounded surface, recalling the roofs of Arab construction on the Amalfi road in Italy.

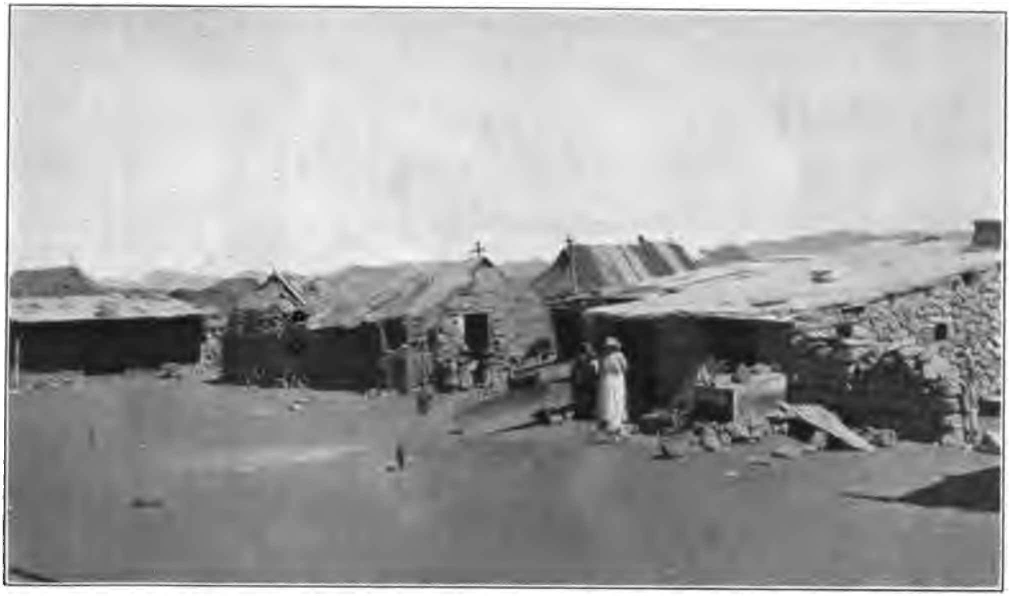
The head of the chief English wool firm here is an Oxford man, and another very gentlemanly Englishman runs a general store. The general manager of the Ferrocarriles del Sur, the chief engineer of the line, and also the assistant manager now in charge, are Americans. All the locomotives are American, and apparently the rolling stock, too, is of American origin put together at Arequipa.

The slowness of a bucket brigade putting water in our car was one factor in making us leave Juliaca at 9.20 A. M., fifty minutes late, on the morning of July 13. From Juliaca we crossed a river and then sped over a continuation of the broad plain we had come up, and rounded a shoulder to the left into a still broader, gently rising plain. It looked like the bed of a small lake, bounded on all sides by low mountains and dotted here and there with a rocky island; the same soil, ranging from dirty red to gray black, and covered with patches of tall and short yellow grass. A good deal of the surface had evidently been under cultivation in former years, and here and there patches had been recently plowed for barley. There were a few swampy bits and pools of water, which, however, evoked from the soil no reeds or other vegetation of any kind—a dusty, desolate country—supporting, however, very considerable numbers of cattle, horses, alpacas, sheep and llamas. At Pucara people were arriving for a fair in the village far to the left of the line. Farther on, at Ayaviri, the valley had narrowed and the river had dropped fifty or sixty feet below reddish banks of clay and gravel, the floor of the valley being broken into many levels, the soil always from a dirty red or gray to a seal brown for the best. Cultivation gradually ceased as we mounted to La Raya (14,232 feet). This is a most interesting spot. The valley is narrow and on the opposite side from the line the yellow drab hills open to show above a fine mass of perpetual snow sharply outlined on the right against the black igneous outcrop of one slope, itself brushed with snow. Down from the snow between these slopes oozes the water from the snow cap of Vilcanota, forming a sodden incline. In this are formed many little trickling streams that wander about and form two or three pools grown with reeds, and on which we saw some ducks. Just here the water seems undecided which way to flow, but one can clearly see that from the same pools two streams start in opposite directions, one toward the Pacific, which is the one whose course we have followed and which we crossed near Juliaca. The other is the Vilcanota or Urubamba. The source of this river in the snows of Vilcanota is said by Mozens to be the source of the Amazon, upon the agreed principle that the source of a river is the most distant of all the sources of its affluents. The railroad follows this same river all the way to Huambutio, where it is joined by the small stream that rises by Cuzco, and which from this point the line follows. One can see to the right the narrow valley opening to the northeast through which the Urubamba flows down to the montaña and to the basin of the Ucayali. Just beyond Aguas Calientes, ten kilometers beyond the divide, but nearly a thousand feet lower, cultivation again begins. Even at the highest part, right under the snow, there were great numbers of animals grazing. As we descended toward Cuzco, the soil rapidly improved for agricultural purposes. The huts are better and neater in construction and thatching, but still all of adobe exactly matching the background. Terracing occurs almost everywhere so soon as the floor of the valley itself is cultivated. At 12,101 feet, cacti became numerous and it began to be green along the stream, and we saw almost the first trees since Arequipa. As the valley widened we saw occasional more prosperous-looking dwellings, where it had been worth while for large landlords to take the land and work the

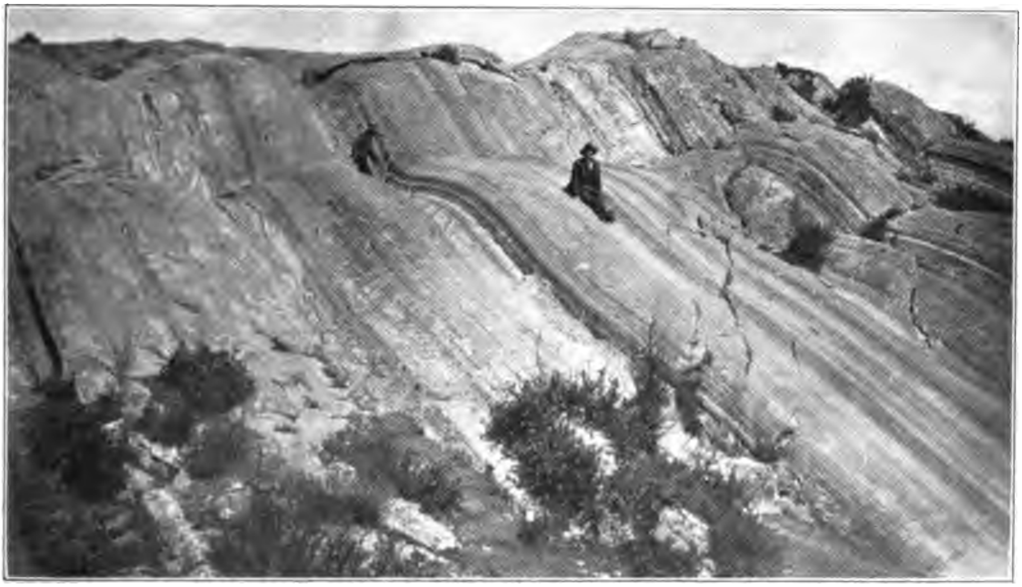
Indians on a share scheme, paying them a little money but mostly in part of what they raised. At Sicuani (11,652 feet), a large village, we saw the first really green fields and the first tiled roofs, and the better buildings also began to be kalsomined. Mangueys also appeared. Later the valley again narrowed and became poorer. Afterwards it again widened and the agricultural and irrigation arrangements were better than ever. We saw barley being threshed by the Indians, who stood in a ring and made their cattle tramp upon it. We also saw some plowing being done with wooden plow and yoke of oxen. At about 11,130 feet we saw our first green fields of alfalfa, our first maize, and even growing flowers, and from here on to Cuzco fields of maize predominated and the country seemed almost a fat land. It seems they plant hereabouts about November, when their local rainy season begins, and reap in May or June, after it has ended.

Even about Arequipa the Indians seemed more sophisticated in dress and ways than those of Ecuador, and the cholo element seemed very prominent. From there on the exceedingly sparse population as far as Juliaca, and the much greater population from there to Cuzco seemed Simon-pure Indian. At the stations one would see a few Peruvians of European blood, and a few cholos. There were usually a few military officers, not bad looking, but too slack to keep their uniforms well brushed and smart. There were a few rather blooming looking cholo women beginning to dress toward the Lima fashion, ranging down to some cleaner looking Indian women in shoes, dresses, hats, affecting the conventional and forming a curious incongruity between the effete Peruvian and the primitive majority. These last, the Simon-pure Indian, were very interesting to watch. One type of the women have narrow eyes, heavy jaw and chin, and prominent teeth and mouth, which, enhanced by the invariable lump of coca in the cheek, give them a curious monkey-like look under their mannish hats tilted forward. They wear a sort of waist hooked or buttoned up the front, and bulging skirts of red, blue, yellow or black, and usually a sort of shawl, plain colored generally, and used in the carrying of a pack upon the back. All these people are utterly filthy, with the dirt ground in so as to make their hands and feet and ankles and arms and necks and faces almost the color of negroes. Presumably in the whole of their lives they have never taken a bath. The men wear trousers to the shin, often black, with underdrawers, shirts and waistcoats of stuff like burlap, and with ponchos always of stripes of blacks, reds, yellows, etc., a little like a subdued and mournful fashion of a Roman scarf. Perhaps the majority of the women and half of the men are barefooted. Those shod have leather flat soles bound with a thong between the great toe and the next one and around above the ankle, strongly suggesting the Japanese *zori*. Most of the men wear a sort of woolen cap with embroidered straps covering the ears, and on top of this a dirty white or black felt hat. The women's hats are particularly interesting. Many are the gray and black felt ones seen at Huancayo. Others are a stiffer, lighter looking material, black in color, with round, very low crown, and broad upturning brim. Others of the same material have the brim oblong, with a fringe of red hanging from the two ends, and sometimes with gaudy gilt and silver embroidered decorations across the visor part or even covering the whole surface. The shape of these strongly recalls a hat seen in old Spanish pictures and may well be reminiscent of a Spanish fashion which impressed the conquered people. Others, including some of the men, wore round flat hats of straw quite Chinese looking. Many of the men wore scarfs as well as ponchos, and some had waistcoats of bright buttons and some slight decoration.

The types of these people could, I should think, be readily classified: There is the Simon-pure type I have mentioned. There is a more hairy type, with straggling beard, high cheek bones, with the look of some Tartar strain. There is the undistinguished type with big oval face, prominent cheek bones, medium eyes, and oily look and vigorous body; there is the more spare type with unmarked aquiline nose and well-developed brow and good-looking chin—altogether a rather handsome profile, often spoiled, however, by too prominent curves outward to the mouth. This last type has the finest eyes and is the most distinguished looking. One would suppose it to be descended from a forgotten aristocracy. The race have bodies rather long for the legs, but well formed and with rather shapely ankles, feet, and wrists, and hands. The women have very pretty voices and a most engaging smile in talking to one another. The men, too, have merry expressions when animated.

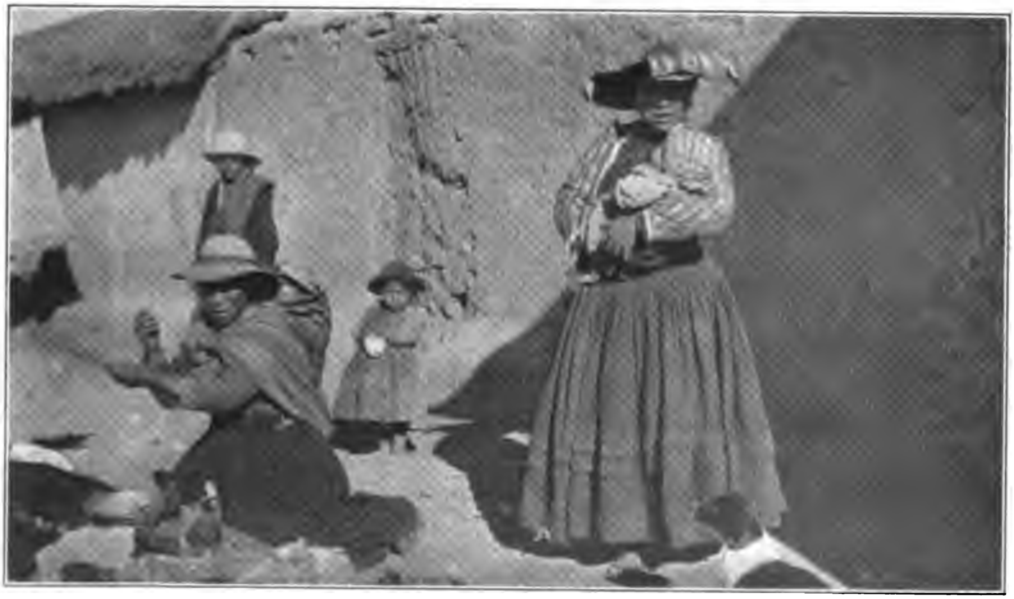


Type of Huts between Arequipa and Juliaca, at Pampa de Arrieros, Peru.



The Rodadero or Sliding Stone at Sacsahuaman, near Cuzco, Peru.

Near Arequipa, Peru.



Types Seen on the Route between Juliaca and Cuzco.

and one notices often among them all amused expressions and laughter, as if they were not without a sense of fun. With white people they are more reserved. It is nearly impossible to evoke a smile from one of them. In the plaza of Sicuani three or four hundred sat spreading their wares before them, but one could nearly have heard a pin drop in the silent glare of the morning sun, so little did they speak and so low were their voices. Through the country one saw them trudging along, always moving something from place to place on their backs, or standing silent by their adobe huts among their beasts, or out on the bleak pampa with their flocks. So rigorous is this climate, so harsh their life, and so bleak their surroundings, that one can hardly blame them for their filth or for consuming quantities of the alcohol I saw arriving at the stations in cases marked 40 per cent. Out on the fields and in their abject villages they seem to live a life of intimacy wtih their animals and scarcely differentiated from that or their animals. One wonders whether education, if forced upon them, would not bring with its inevitable discontent a horror of their surroundings which would depopulate a country too bleak and dreary for anyone not either very near the beast or very near the God-like philosopher.

On the trip from Mollendo to Arequipa, Arequipa to Juliaca, Juliaca to Sicuani, and Sicuani to Cuzco it was necessary for every one to sign a paper giving the full name, and also where one intended to go. Upon inquiry, one found that this information was intended for the prefects of police of the various districts. At Cuzco one was given a form to fill out with columns for the name, nationality, business, where one came from, how long one intended to stay, and where one was going.

At Sicuani there is a post of mountain artillery, and we saw them drilling as we passed by. We reached Cuzco at 8 P. M. on Monday, July 13. The next morning, Tuesday, July 14, we got our first glimpse of Cuzco, which lies in a sort of *cul de sac* at the top of this branch valley, and only a couple of miles or so below a "knot" through which Mr. Reed's railway passes to go down to the montaña after traversing a big pampa not unlike the one we had come up. From the station one sees Cuzco beginning three quarters of a mile away and stretching across the valley to right and left, a plain of tiled roofs marked by the towers of brown stone churches and tending up a quebrada, at the top of which one could discern a bit of the wall of Sacsahuaman just below the dome of a little hill marked by a large wooden cross. After breakfast we all went together up to town, the road passing under an arch as the city began. The conveyance was the tramway drawn by four mules. The car was American built.

First we looked into the patio of the University, where there was a tennis court beyond a sort of barroque Renaissance brown stone façade of ecclesiastical design like that of the Church of the Compañia, which it adjoins, and like, indeed, all the churches of the place. Next we saw the church of La Merced. It was rather ugly, except for three or four pieces of good wood carving, painted bas-reliefs recalling Quito, and a couple of angelic figures at the upper corners of the high altar. I had a look into the convent proper of the Mercedarios—rather unprepossessing and Indian-looking individuals in white flannel robes. A rather intelligent one of them showed us around. Upstairs was a crudely carved choir. The patio had been handsome, with ornate wooden ceilings and the Moorish-looking columns and arches common here.

The Cathedral is large and fine. Its chief points to me were a really fine choir of carved wood; opposite it an altar of tremendous size and weight, entirely of silver, but without charm of design or special skill of workmanship; in the sacristy a series of portraits of Bishops of Cuzco, beginning with Valverde, of popularly infamous memory; in the sacristy, too, were on each side three really pretty pictures of religious subjects with truly Italian backgrounds of blue Umbrian scenery. Here, upon our second visit at three o'clock in the afternoon, the canonico, an intelligent and genial individual, laboriously unlocked and displayed to us a beautiful reliquary in fine silver work and adorned with many large emeralds and some rubies, pearls and diamonds. He also showed us the crown of the Virgin, similarly jeweled, and a big star-like ornament intended to fit on the top of the reliquary. These things had been given by the people of Cuzco. During this inspection by candle light in the dim room, various little urchins and others strolled in to enjoy the sight, behaving very well, but smelling very bad.

After the Cathedral, went on to the Church of San Blas, in general very ugly, but worth visiting because of the really marvelous wood-carved pulpit showing egregious talent in imagination and workmanship, its design of heads, arms, and busts, fruit and flowers, harmoniously mingled with conventional curlicues. So metriculous is the design that even the tongue in the mouth of one of the heads one finds arranged to wag when touched!

In the afternoon, always with the "Inca Princes," our guide, I did the Church of San Domingo. Here there was nothing to see but two peculiarly horrible images of the crucified Christ, and we fled from the Church. A padre showed me the patio and the Inca remains of buildings on which this church was superimposed. There is one Inca room, two sides of which are intact, with the fine masonry and usual niches, either for penates or merely shelves, maybe. In a passage I was shown a similar bit of Inca wall, and then in a back yard we saw the beautifully built, rounded wall of no great size which had been the Temple of the Sun, some twenty to thirty feet in height, which now supports an alcoved balcony and the site of the church.

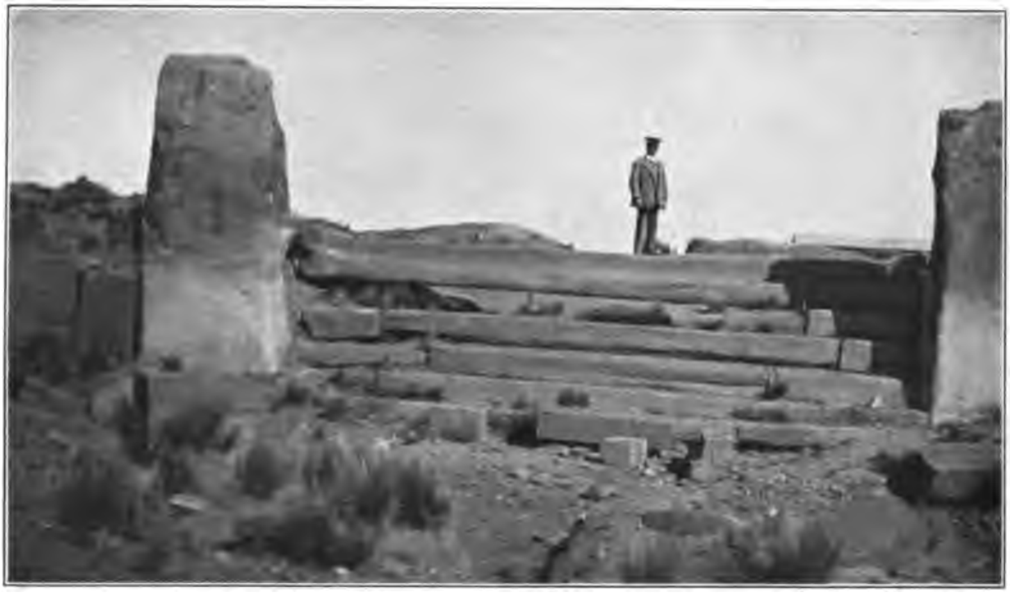
The peculiarities of all this probably pre-Inca masonry are the perfect fitting of the stones without the use of mortar; the shaping of stones with many angles (one has twelve); the frequent cutting of a stone to turn a corner, where other masons would surely have two stones meet; and lastly, the occurrence of gigantic stones put in place in a day when machinery, as we know it, was unknown, but when, be it remembered, labor was plentiful and compulsory. The most remarkable wall in the city is the one a block and a half long which goes down the narrow street flanking the Jesuit Church. This wall is supposed to have belonged to the Temple of the Virgins, which one gathers is a euphemism for the Incas' very well stocked harem. On the narrow street going toward the Church of San Blas is a fine wall, in which occurs the twelve-angled stone. This type of masonry occurs often enough in patches on both sides of the narrow street to show that the ancient dwellers also ran to very narrow streets.

Cuzco is as dirty and smelly as Quito, its plazas and very best quarters being, as in Quito, fairly decent. Viewed from a neighboring hill, it strongly recalls Quito—a field of brown-tiled roofs; walls of white and of various tints, and here and there yellow squares of roofs, showing within the patios graceful columns and arches. It is more monotonous than Quito, because the churches here are brown, too, and its site across this valley is not nearly so pretty as the position of Quito, nestling around the Panecillo and up on to the foothills, straggling toward the north by the Ejido with a far greener setting, and, seen from a hill, with its snowy mountain peaks in sight.

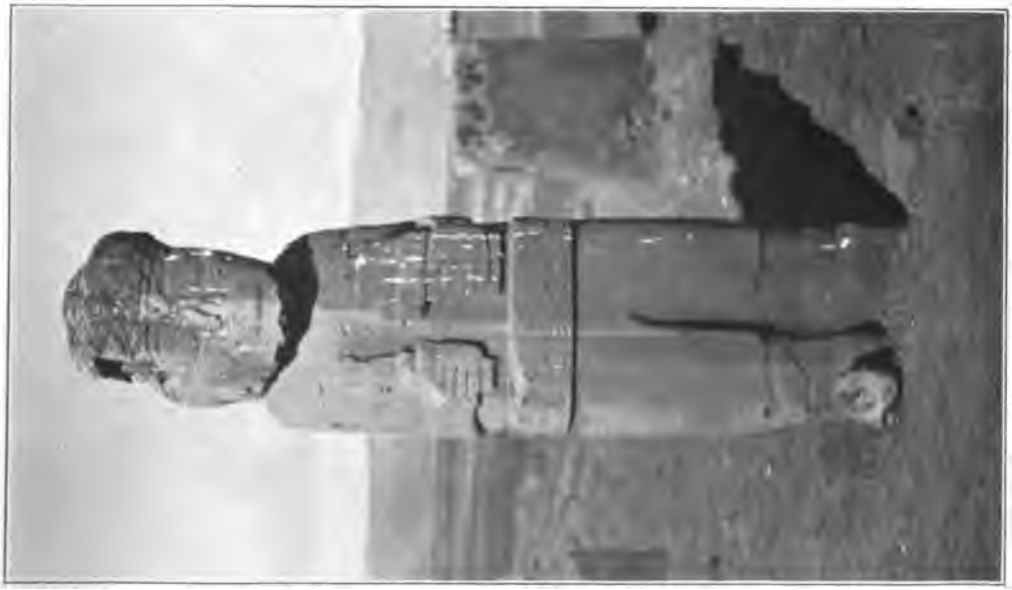
The main Plaza of Cuzco is very pretty, and surrounded on two sides by churches and on the other two by colonnades and shops in buildings tinted many colors. The Cathedral is raised up on a gravelly clay mound—a most unkempt approach. Walking over its dirty surface one can see bits of human skulls and bones showing through, and where a little wall is being built, presumably to improve the approach, a pile of dusty bones and skulls have been thrown out on the street. As elsewhere in these countries, there is no well-organized effort to study and conserve the slender evidences which time has left for the present study of these antiquities. Like much else in Peru that requires effort and enterprise, this is left to the foreigner, as witness the Yale Expedition now at work some sixty miles north of here.

Besides the main plaza, there are two others, one large, one almost filled with market stalls for the Indians, and another with a pretty garden and a cigar-store-Indian monument. In some of the streets we saw the oddest mixtures of a bit of Inca masonry, topped with a Spanish arch and perhaps armorial decoration, or with a doorway flanked with classic-looking columns of Spanish workmanship. In the streets the Indian vastly predominated, with a sprinkling of shoe- and collar-wearing cholos, and but very few people appearing to have predominant Spanish blood. Some of the streets are so hilly that the stones are laid in steps, and one meets droves of surprised-looking llamas, donkeys, etc. The architecture strongly recalls Quito, although the balconies are finer in design. Seeing such things, we spent the rest of the afternoon.

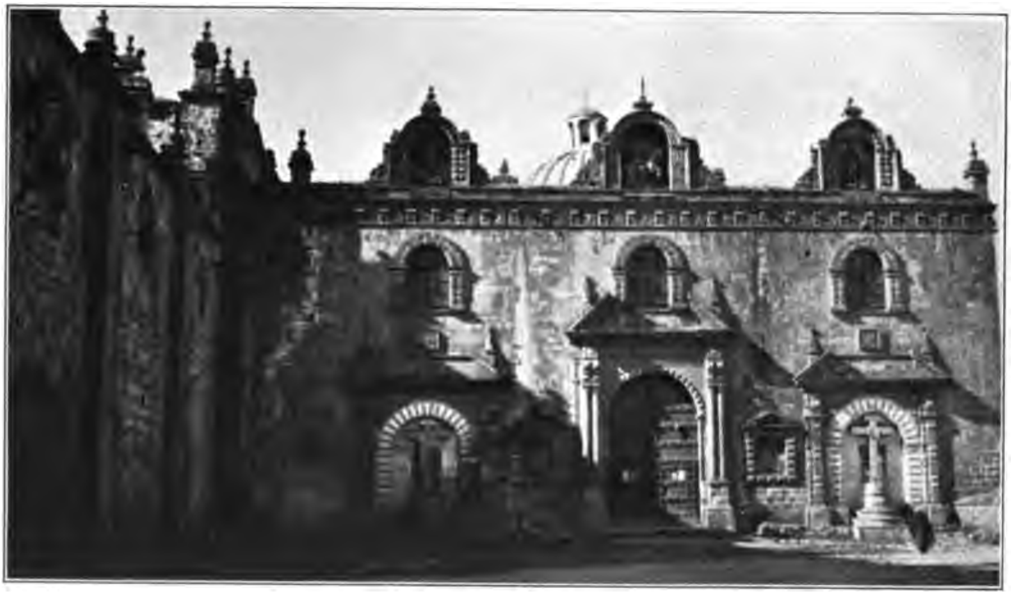
The next day, Wednesday, the 15th, with horses to ride, and followed by the "Inca Princes," started out to see the sights. The horses were good and climbed safely up the steep rocky part to the Fortress of Sacsahuaman. On the side away from the city the wall is very fine. It is a long succession of angles artfully arranged so that the defendants could rake those attacking. Within are



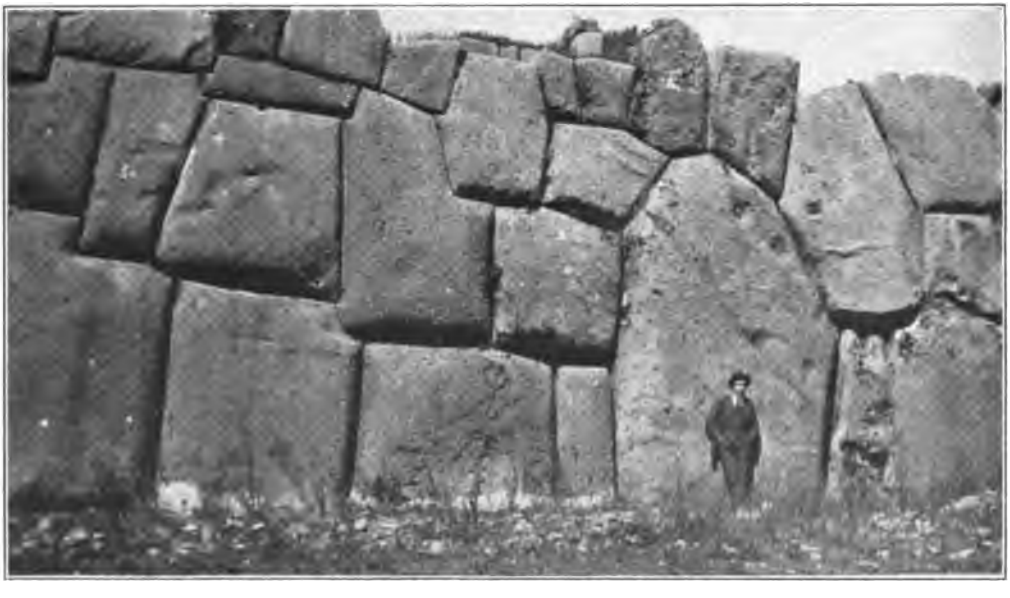
THE STAIRS OR STEPS AT TIAHUANACO, BOLIVIA.



THE STONE IDOL AT TIAHUANACO, BOLIVIA.



The Church Adjoining the Left of the Cathedral at Cuzco, Peru.



An Idea of the Size of the Stone Used in the Construction of the Inca Fortress of Sacsahuaman, near Cuzco, Peru.

similar walls of smaller stones in two rows, following the same design. These must have left the top of the hill as a final stronghold, and must have encircled the hill entirely in the old days. Some of the stones are of quite amazing size. While we were here, dismounted, one of the horses ran away and dashed about with the saddle slipped back to its flanks, but soon got winded and was seized. Then we clambered on to the hill beyond and looked at a lot of seats cut out of the stone, and other odd stone cuttings, some of the form of steps upside down. The most intelligible was a row of steps supposed to have been the site from which the Inca Prince watched the construction of his fort. There was, too, a funny place where the stone made a sort of Coney Island slide, and one took a sitting excursion down it. On the way home we stopped at a house in a beautiful grove of eucalyptus, and boasting a good ruin of two sides, a door and window, intact, of the fine old masonry, which I noticed here was filled in in parts of its massive bulk with ordinary rubble inside the handsome stones and niches. From here we made our way on foot back to the Plaza and disbanded, saying farewell to the "Inca Princes" and returning to lunch on the car, being carried to the station as usual by the tram.

In the afternoon Mr. D. C. Reed, an American, arrived. He has been continuously in Peru ten years working in high altitudes, at Cerro de Pasco, and at Huancavelica, where the wonderful quicksilver mines used to be (16,000 feet was the altitude of the mine he was at). He has been told by Doctor Fenn that he must leave. However, he has a contract for this narrow-guage railroad down to Santa Anna, in the montaña, and sticks here at this dangerous altitude to do his work. After a long talk, I went with him on a flat car for the rest of the afternoon up his line as far as one could go. He takes it out of the valley very skilfully by 3½ per cent. grades, and, I regret, on German rails and German metal ties. The Koppel firm, well represented in Lima, underbid the competing American firm it seems. At a slide where he had a lot of Indians working, a hand-car was carried over, and we continued to where they were grading a quebrada. The Indians seemed to be working very briskly under cholo foremen and for fifty centavos a day. Across the top of the Cuzco Valley here, we could see Reed's line heading north after a detour behind us and back along inside of the hill at our front. After passing that divide, he will have smooth sailing for a long way over the pampa. He says the other engineers had pronounced this project impracticable. We got a fine view of Cuzco, and it was interesting to meet Flemming (Yale), the superintendent, and to see the merry zeal and sportsmanship with which these men were pushing on their task.

We did not go up to town to see the religious fiesta, in which 2,000 to 3,000 Indians celebrated by drinking heavily and drawing through the streets a large float, with religious images, to the accompaniment of a horrible band, and the firing of fireworks with fine indifference to the crowd. Over the doors of the churches were placed mirrors in carved wood frames not unlike those we purchased at Quito, and which I judge have some Indian religious significance. There were also several set pieces of fireworks arranged on bamboo scaffoldings and producing beautiful effects.

In Peru curious religious combinations by the Indians are often noticed. In Arequipa especially, in the yard of the Church of the Compañia, I saw a huge cross bearing at the end of one crosspiece a big disk of the sun, with a jolly smile and rather humorous mustache and goatee, and the moon also figured; near the base, three or four dice, nails, thorns, basin, and other material objects associated with the crucifixion. We noticed these same things on crosses on many a lonely highway in the country, but especially interesting was the recurrence always of the face of the sun upon the cross itself.

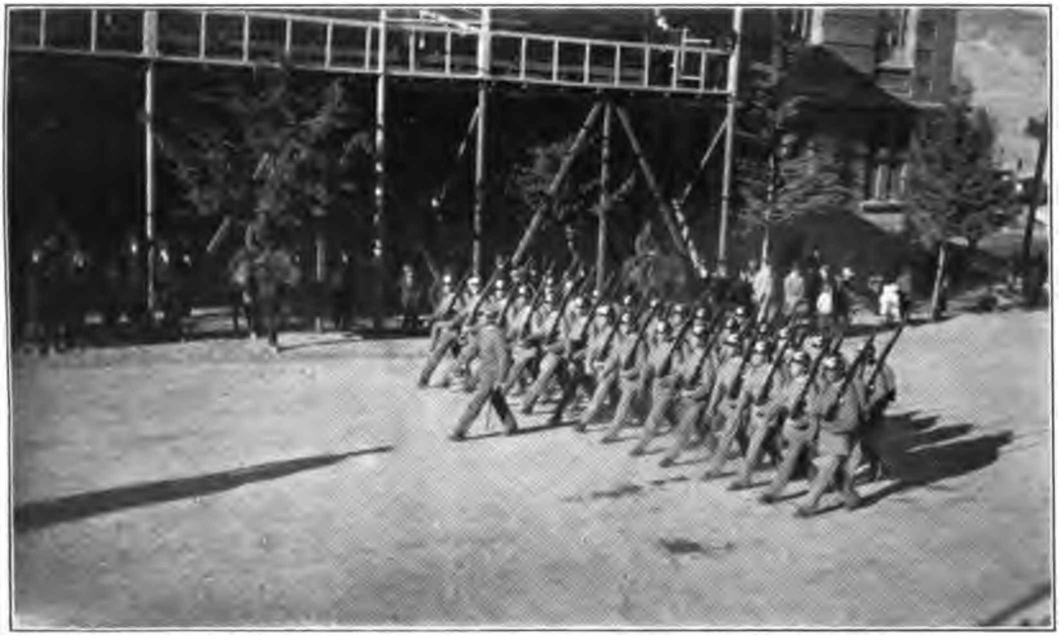
On Thursday, the 16th, at 7 A. M., the train left for our return journey, uneventful except for the almost unbearable dust, to Juliaca, which we reached at 5.45 P. M., and then on, to arrive at Puno Muelle, beside Lake Titicaca, at 6.45 P. M. Here, after another night on the car, got up this morning at 6 o'clock to go aboard the *Yapura*. This is a marvelous little old boat of three hundred tons, engines by Watt & Co. put together in 1862, boasting of an old-fashioned hand windlass and candle light, but doing business at the same old stand in the most admirable manner. The Peruvian Corporation has two large fine steamers, but this one was given us for this wonderful daylight trip across the Lake to Guaqui. The captain had an Irish father and a Swedish mother, was born in Peru, baptized in Chile, and is a member of the not small number of foreigners in Peru, and, as I suppose, still more in Chile and Argentina, who bring very energetic blood to these countries.

The brilliant morning sun and blue sky showed us where the railway line had come through a gap back at our right and had run along the shore through the little brown village of Puno, nestling on the hillside, and out on to this mole, from which we soon cast off. First we made our way across a broad space until we reached a channel, perhaps half a mile long, dug through a bar on which grows a long rim of reeds from one side of the Lake, round like a breakwater. Once past this, we went straight ahead for half a dozen hours, fairly near the western side of the great Lake, until it narrowed to some straits, which we passed shortly before coming to a stop alongside the Island of the Sun. During the forenoon, above the left side of this strait, we saw three great snow mountain peaks rising to little points in a white range of snow. The rest of our horizon was of mediocre hills or mountains just like those surrounding the great pampa through which we had passed. The Island of the Sun was rather tedious, a rocky climb, a lot of dusty terraces, and some shabby buildings built of unimportant stones stuck together without nicety. They had low doors and floors below the surface, the usual niches, and some larger ones the height of a man, and the roofs were roughly arched with stone. This was the palace of the first Inca, the books say. Then we clambered down and went back to the steamer, to round a little point, where we were again rowed ashore. This was the Garden of the Inca. There is a little sheltered hollow rising from the stony beach up the hillside, with stone steps by the side of a fine flow of water, which went through well-walled terraces up to a three-mouthed fountain, from which, passing under the platform just in front, the water goes on down. These terraces have now been growing maize, barley, etc. There is a variety of trees, some fine ones, and there are a good many flowers, big forget-me-nots, pansies, primroses, etc., due, no doubt, to the present owner, General Pando, whose house is nearby. It is a lovely fertile plaisance, sheltered, and receiving the sun from the northeast. We are for the first time on Bolivian soil.

Three miles steaming, and we landed opposite at the little Island of the Moon. Here we saw a lot of unattractive, rather sore-eyed Indians who called themselves Aymará, and who helped us ashore. We clambered up where there was one terrace faced with fine niched masonry. The other terrace above was of the later inferior variety, as were the remnants of buildings, which had the inevitable niches, but nothing of beauty or interest to the uninitiated. This, it is said, was the Temple of the Moon, before which, on the terraces, danced the Virgins of the Moon. Now we find this miserable group of Indians, with nothing cheerful but the pink, orange, red and blue skirts of their women, and the families of pigs, calves, etc., that now occupy what is left of the ruins of these sacred precincts.

As we steamed on, this Island hid the Island of the Sun, until at sunset, looking back, we had a lovely view of the mouse-like shape of the Island of the Moon, with three trees at its western end standing out against a patch of cloud burnished by the sun, in the little dip to the left of which rose the dark shape of the Island of the Sun, continuing nearly to where we could see far back the straits through which we had come. Forward, to our left, the hills grew amethyst, and above them, higher and higher, rose the snow mountains. One is Sorata—*according to the Captain* the highest peak in South America. Its top was bright, and then the sun left it, as we steamed on toward another strait far ahead, still six hours away from our destination. The Lake is huge, and it seems incredible that instead of being at sea we are 12,500 feet up in the air and are actually on Lake Titicaca, one of the most remote and glamorous points one knows on the map.

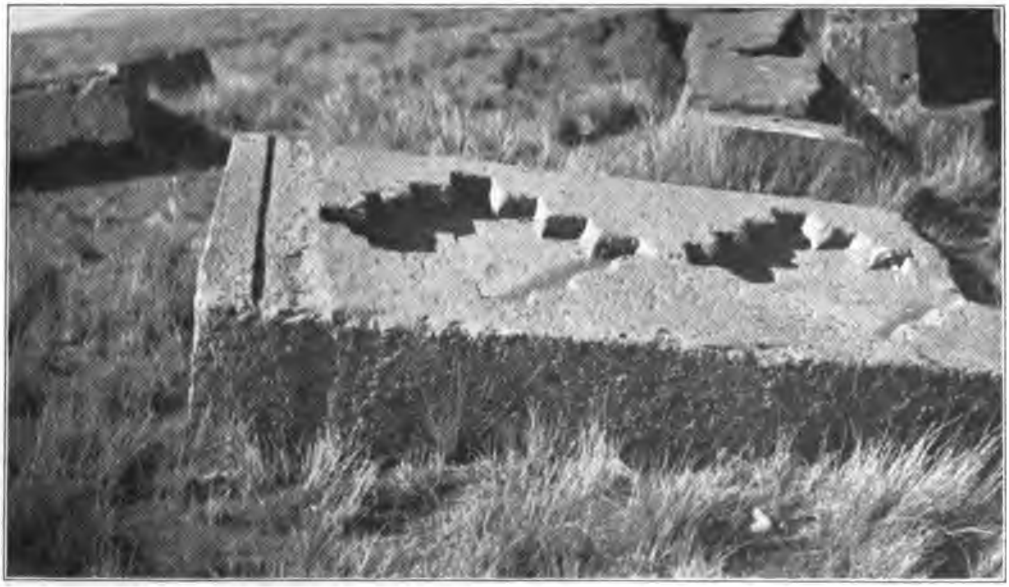
As we left Puno this morning, we passed an Indian village with its fleet of balsas moored in front, and the line of its fishnets, also made of reeds staked out in the water. Occasionally through the day we have seen terraces, patches of yellow barley stubble on the mountains; but it looks a hungary country. I am told that hereabouts much of the land is held in large haciendas. After it grew dark, for the first time in my life I saw two stars so brilliant as actually to cast a path of light on the dark water almost equal to that of a waning moon.



THE GOOSE-STEP IN LA PAZ.

GERMAN-TRAINED SOLDIERS; GERMAN COMMERCIAL HOUSE. DAY OF OPENING OF CONGRESS, LA PAZ.

Llamas in La Paz.



One of the Carved Stones at Tiahuanaco, Bolivia.

CHILEAN LEGATION, LA PAZ, BOLIVIA,
August 7, 1914.

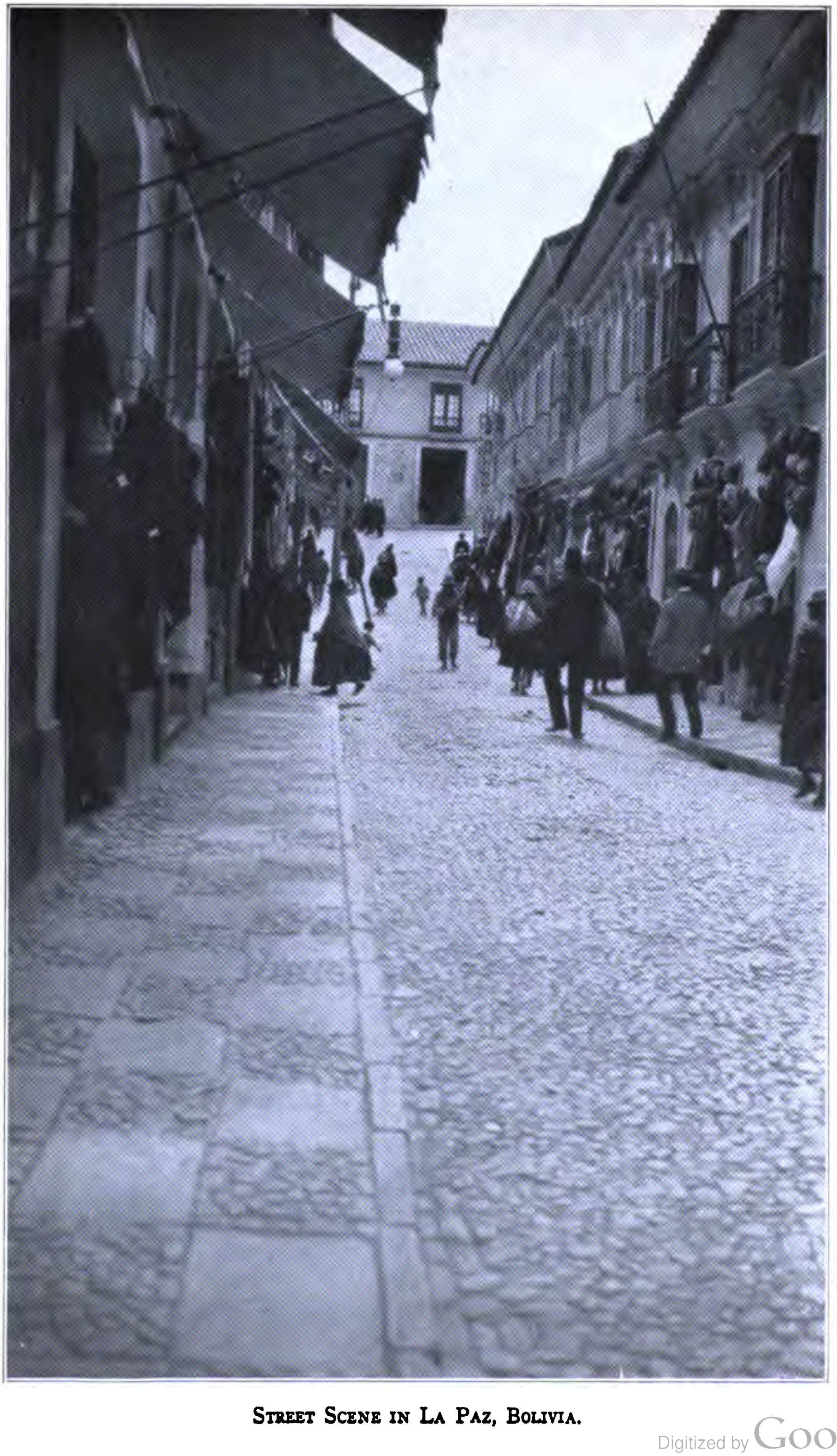
At Guaqui we moved over to dine and sleep aboard the *Coya* and at 8.15 A. M., took the train for La Paz. The country continued a monotonous yellow, with dark brown soil where it had been upturned to plant barley or potatoes.T here was the same rim of insignificant hills, as if marking the former boundaries of a greater Lake Titicaca, and in the distance the snowclad mountains to the east. In about forty minutes we pulled up at Tiahuanaco, where we spent about an hour and a half rambling among the curious ruins. There is a large and rather handsome church, around which cluster the equally brown adobe houses of the present small village. In the midst of the ruins, a highly æsthetic government has erected an iron construction with corrugated iron roof, turned up at the sides like the rim of a hat, and looking like nothing else than an open air market. A few uninteresting scraps of stone lie underneath. It seems hundreds of carloads of stone have been taken from here for building in La Paz. Still one can trace the base lines of several large rectangular constructions, and there is said to be evidence of a boat landing, indicative of the Lake's having once lapped the shore by the then city. Really marvelous is the gigantic stone arch hewed from one piece, with its curious monotonous carvings of grotesque symbolic figures. Another incredibly large stone hewn out into a shape like a miniature amphitheater, with tiny steps, etc., which we took to be a sacrificial altar, was impressive, as were also the colossal brown stone steps and the many other huge stones, some cut through in curious angular designs and others hewn into angular depressions which one imagines may have been for purposes of fitting them together without mortar. We climbed up the odd-shaped hill with a water-filled hole where some Spaniard had dug for treasure, and with evidences of fortification and of drainage, as if this might once have been the citadel.

Going on toward La Paz, the puno became gradually more and more bleak, the rim of hills receding in places to great distances. There were some sheep and llamas grazing, many of the later showing by their thick necks and more shaggy, thickset appearance that they were crossed with alpacas. The soil grew more and more stony, until for miles we could see that the stones had had to be patiently raked into huge piles in order to leave little spaces for the pathetically scanty crops of this region. Miserable-looking Indians plodded along with their animals, bundled up in ponchos, shawls, and the invariable cap with its ear flaps, surmounted usually by a slovenly felt hat. Such was the country about Viacha. At this point the Guaqui Railway, the Antofagasta Line, and the Arica Line meet. As our train stood here the many little columns of whirling sand, which we had been passing, gave place to a furious dust storm, accompanied by hail. Verily, Viacha appeared to be the bleakest spot on earth! From Guaqui on we had seen the Bolivian flag quite often; its red, yellow and green the only brightness in the sort of Gustave Doré infernal aspect of this dreadful puno. From Viacha we ran along until at the Alto our car was hitched on to a trolley car. Here the view ahead was the dead level of the puno, merging into mountains of a sickly gray beyond, above which towered Illimani to the right. Then in a few minutes we had the amazing impression of finding our puno broken off suddenly. At our feet, in a drab trough, lay a city about the size of Quito. Dull red roofs of tile, a dominant note of icy blue, due to corrugated iron and a peculiar blue kalsomine, and a dead yellowish ashen gray of mud mountains washed into grotesque shapes—all with no setting but a patch of mournful dark green down the slope of the valley to our right, and with here and there some little green spots—microscopic fields of vegetables, and another touch of this mournful green marking the cemetery. The trees, I found, were eucalyptus, but somehow lacking here the bright color of that tree, and also a sad sort of cedar.

The electric line winds and twists down a very steep grade until it brings us down at the station at the upper end of the town. As we came down, we saw long lines of llamas and other pack animals winding their way, antlike, to and fro from the puno, and we passed the little stream which runs through the city and along which hundreds of Indian and cholo women were washing their bright-colored clothes, each blissfully oblivious of the dirtiness of the stream, and of her neighbor making it still dirtier higher up. We were in La Paz, the highest capital in the world.

Street Scene in La Paz, Bolivia.

House in which Bolivar Died, at San Pedro Alexandrino, near Santa Marta, Colombia.



Street Scene in La Paz, Bolivia.

DALMATIA.

GLADYS TEMPERLEY.

(From "The Near East.")

Dalmatia is a coast strip squeezed in between the Adriatic and the vast limestone barrier of the Dinaric Alps which in some places, as, for instance, near Ragusa, approach within a few miles of the shore. It runs from a point due north of Zara to a few miles south of Cattaro.

Dalmatia includes three harbors of great importance, Zara, Spalato, and the Bocche di Cattaro—the last the finest natural harbor in Europe, perhaps in the world. In the Bocche ri Cattaro the whole British Fleet could ride at anchor. In addition, there are the three minor harbors of Gravosa—the port of Ragusa—Sebenico, and Trau. The Curzolari Islands are of great strategic importance. As the islands are very numerous and the distances between them comparatively short, they form ideal lurking places for submarines. The readiness of communication between them is illustrated by a famous Dalmatian legend similar to that of Hero and Leander. In this case, however, it was the lady—Margherita Spolitano—who used to swim nightly from one island to another to visit her lover. Ultimately Margherita was discovered and drowned by her brothers. Submarines now follow in the track of Margherita.

A record of the naval importance of the Dalmatian islands is to be found on the island of Lissa, where a marble lion commemorates the victory of the Austrian fleet over the Italians on July 20, 1866. The victory was the more remarkable because the Austrian fleet had no proper ironclads. Lissa was also the scene of a victory by the British over the French in 1811, which the British characteristically refused to commemorate, and have now long forgotten. Curzola was the scene of many Venetian naval battles in the Middle Ages, and was occupied by the British, who built a fort there in 1813. There are many excellent harbors in these islands, but the chief mediæval harbor was on the mainland at Stagno, the outlet to the vale of the Narenta, now a place of no importance. Stagno was the harbor of the mediæval Bosnian kingdom, and was connected via Sarajevo with mediæval Serbia. It was ceded by Stephen Dushan—the greatest of Serbian mediæval monarchs—to Ragusa, but was used by him as the base for an advance up the Narenta in 1351. The numberless islands and indented fiords on this coast contrast strikingly with the Italian shore opposite, where harbors are almost nonexistent, and where ships consequently have no protection against the Scirocco and the much-dreaded Bora or "Wind of the Dead." This in winter sweeps down from the narrow mountain gorges of Dalmatia in sudden and almost irresistible gusts, dangerous alike to landsmen and mariner. The islands afford an ideal protection against this wind, but between Ragusa and the mouth of the Bocche and between the inner islands of Lissa and Lagosta very rough weather is often experienced. Like the Lake of Galilee, the Adriatic is tideless, but subject to terrible storms. In such cases the Curzolari Islands provide a haven of refuge.

Traffic between the Dalmatian towns is seaborne, and railway communication with Bosnia is scanty and difficult. The rivers are few, little more than mountain torrents in the upper part of their course, and are often nearly dry in summer. In many places the absence of lakes and even of springs makes the construction of artificial reservoirs essential. Between Zara and Spalato the land is especially stony and barren, and the bare white hills resemble a gigantic wall.

In classical times Dalmatia was obviously incapable of producing much. According to Strabo, it could barely support its own population, though he seems to have thought this was due rather to the ignorance of the inhabitants and their lawless character than to the inclemency of Nature. As a matter of fact, the heavy rains have a tendency to wash away such soil as collects on the mountains, and it is only by a system of artificial terraces that the population has been enabled to falsify Strabo's description. From Spalato southwards and on the islands the country is much more fertile, and vines, olives, figs, pomegranates, and oleanders grow luxuriantly in a semi-tropical climate. The jackal, another semi-tropical product, is found both on the coast line and on the islands. The climate gives a special character to the wines of the country, for the sun and the limestone limit the moisture in the grape. As a result, wines which the traveller imagines to be as light as Chianti or Capri he finds to have the strength and weight of Madeira. This characteristic, like so many others, emphasizes the difference between Dalmatia and the Italian coast opposite. The Adriatic abounds in fish of all kinds, many peculiar to Dalmatia, the strangest of which is the Dalmatian catfish, whose sandpaper-like skin is used for scrubbing tables and floors.

The characteristics of such a land are obvious from this description. All its lines of development stretch out towards the sea, over which is borne food, wealth, civilization, and the arts. As Venice is the nearest good harbor in Italy, it was there that the chief center of attraction was to be found. But Rome left its mark on Dalmatia long before Venice did. The influence of Greece was hardly felt, but as the Roman Empire expanded Dalmatia was brought within its orbit. Pompey showed his genius for organization by clearing the Adriatic of those bands of Illyrian pirates who haunted the creeks and islands of Dalmatia. Angustus reaped where Pompey sowed, and Dalmatia became Roman under him.

It became even more famous under Diocletian, who reared a magnificent palace at Spalato, to which he retired after governing the world for twenty years. More than 3,000 people still live within the very walls of the Emperor's palace. Owing to the solidity of its masonry, the inhabitants have been unable to destroy it, and, though lath and plaster cottages still hide part of the Roman structure, much has recently been revealed by the demolition of modern buildings. The style is of great interest as a transition between the Roman and the Byzantine. It stands indeed as an imposing symbol of an Empire that was actually passing from the Western to the Eastern Rome. No one who has seen it can forget the grandeur of its appearance, more especially when one stands at the very center of the palace, near the broken Sphinx, whose paws still hold the symbol of the Sun. Opposite this last great monument of pagan Rome now stands a Christian campanile, and a cathedral rises above the tomb of the great pagan Emperor.

Four miles from Spalato is Salona.

> *Qua maris Adriaci longas ferit unda Salonas*
> *Et tepidum in molles zephyros excurrit Iader.*
> (Lucan.)

The Iader, a magnificent torrent, finds its source in a green valley two miles above the Roman ruins at Salona. The town itself was the naval habor and capital of the Roman Dalmatia. It contains ruins of the fifth and sixth centuries. When the barbarous Avars finally destroyed the town, the inhabitants took refuge in the deserted palace of Diocletian, and thus founded the importance of Spalato. What was only the site of an unusually magnificent Roman villa ultimately became the most important town in Dalmatia. For the time being, however, it was the day of Venice, and Zara and Ragusa rose into importance as the Middle Ages dawned.

From the twelfth to the fifteenth centuries Dalmatia was the battleground of Venice and the land Powers of Hungary and Serbia, which were expanding towards the Adriatic. The struggle could not ultimately be doubtful, for the road by the sea was easy, and the mountains proved more formidable to armies than the Scirocco and the Bora were to ships. Though for certain periods Hungarian or Serbian kings controlled part of the country, their hold on it was never as secure as that of Venice. Circumstances favored the growth of city life in Dalmatia—strong, independent, self-centered and self-sufficient. Thus there arose a civilization as varied and artistic in its own way as it was the far richer and more developed city life of Northern Italy. The apologists of nationality in Venice or Belgrade have claimed that this civilization was exclusively Latin or Slavonic. It is difficult to say that it was either. Byzantine influences were not absent, and in its strange mixture of things that were Roman and things that were Greek, of things that were Slav and things that were Italian, this civilization proved itself eclectic and indefinable.

The sea power of Venice was not directed against Dalmatia until the naval republic decided on making the Adriatic a Venetian lake. With this end in view, she crept slowly along the Illyrian coast, seeking to use each Dalmatian harbor as a naval base and a stepping-stone to further conquests. Zara was the first victim, and the most permanent Latin conquest. It was acquired in 1202, and was the price demanded by Venice for conveying the Crusaders to Constantinople. Zara was more thoroughly Latinized than any other Dalmatian town. The cathedral is Romanesque, and the city abounds in Latin inscriptions and in Venetian art and architecture. Singularly enough, many of the buildings are erected from the fragments of Roman temples and tombs. Zara has since remained the stronghold of Italian influence in Dalmatia. It is now the only town on the whole coast governed by an exclusively Italian town council, and is the only place in Dalmatia where an Italian feels thoroughly at home.

Trau was the next victim. Remote as it is, and seldom visited, it represents perhaps the best example of the civilization which Venice bestowed on its conquered peoples. The beauty of its art makes one inclined to forgive Venice for the cruelty with which it treated its subjects. Yet this lovely little town, still almost wholly mediæval in aspect, with its walls, its gates, and its towers, is not wholly Venetian in feeling. The Loggia, or open Court of Justice, with the winged lion of St. Mark in marble looking down on it, might have been taken straight from Venice itself, but the rich carving in the porch of the cathedral was due to the imagination of Slavonic sculptors working under Venetian influences, but not wholly in the Venetian spirit. Nevertheless the influence of Venice is clearly still supreme.

Venetian art is less evident at Spalato, where the carvings on the great cathedral doorway were the work of Slavonic artists, and at Ragusa we are conscious of a further change. The art and architecture of the city, though Latinized, are clearly original; they are Ragusan, not Venetian. The reason is not far to seek. Ragusa occupied a unique position. Placed as it is upon the sea between two blood-red cliffs, surrounded as it still is by mediæval walls, and defended on the landward side by a gigantic limestone barrier, it was impregnable to attack either by land or sea. Serbian and Hungarian kings besieged the city many times in vain, and Venice found it wiser to make her an ally than an enemy. The result was that Ragusa took all from Venice which she needed and nothing which she disliked, so that in the literature, the art and architecture of Ragusa is found the supreme and harmonious blending of the Latin form and the Slavonic spirit. The Franciscan church of Ragusa, with its beautiful cloisters and corridor, is the work of Slav artists, while the Rector's Palace is a Renaissance building of a true Venetian type. Similarly her churches are filled with paintings acquired directly from Italy, and in the Renaissance period the nobles of Ragusa studied the humanities of their own city and then in the Italian universities.

In the fifteenth century there arose and continued for three centuries a singular Ragusan school of literature. It was written in the Serbo-Croat tongue in Latin characters, and was based largely on Italian models. Every form of literature, from satire and novels to comedy and epic poetry, was represented, and there were also interesting developments in the study of science and history. Here again Latin and Slav imitation and originality strove with each other. It is an interesting fact that, though other towns in Dalmatia and in Jugoslav territory beyond had literary schools of a similar type, there seems to have been no conscious connection between them. Their spirit was wholly parochial or rather municipal. It was certainly not until the nineteenth, perhaps not until the twentieth, century that the modern ideal of nationality, overcoming natural barriers and local prejudices, dawned upon the cities of Dalmatia. Every prominent Dalmatian (if Zara be excepted) has expiated his patriotism in an Austrian barracks or gaol.

The modern aspect of the problem can be given in a few words. The population, according to the census of 1910, consist of over 600,000 Serbo-Croats, of about 18,000 Italians and 3,000 Austro-Germans. The Italians are mostly at Zara, while the Germans are almost wholly officials. These figures tell their own tale, for, though Austrian statistics are not above suspicion, it is clear that the preponderance of Sebro-Croats is enormous. On ethnographic grounds Zara alone can claim to be Italian. No one would deny the civilizing influences which Italy has brought to bear upon Dalmatia, influences which have the permanence of religion, art and trade, but during the present generation the position has been profoundly modified. Before, Italian influences were supreme and Italian business men controlled the city life of Dalmatia. During the last thirty years the Serbo-Croat element has gradually displaced the Italian on the governing bodies of the Dalmatian cities, and the Italian has become a shopkeeper, a sailor, or a citizen of Zara. The Italian contention now rests on memories rather than on realities. The modern feeling is best expressed by a fountain recently erected by the citizens of Spalato. In the midst of the water stands a marble nymph, pointing with outstretched arm towards Serbia.

ACTIVITIES OF THE SOCIETY.

OPENING MEETING.

"THE VIRGIN ISLANDS."

BY MR. THEODOOR DE BOOY.

At the first meeting of the season, Wednesday evening, November 7, Theodoor de Booy, of the Museum of the American Indian, New York, addressed the Society. He took for his theme "The Virgin Islands," formerly the Danish West Indies, the most recent territorial acquisition of the United States. Mr. de Booy, who is a recognized authority on the history and archæology of the West Indies, spoke from the fullness of experience acquired by six months' residence in the islands bought from Denmark for $25,000,000; and he illustrated his talk with excellent lantern slides.

Before the lecture, Henry G. Bryant, as President, delivered a brief address. In part he said:

"To tell the truth, the past year has not been a notable one in exploration or in the various phases of geographical work. We recall the dramatic rescue and safe return of Sir Ernest Shackleton's party, from the Antarctic, and the safe return of Donald B. MacMillan after his four years' sojourn in the far North. It gives me much pleasure to announce that at our next meeting on December 5 Mr. MacMillan will address the Society and give us an account of his quest for the illusive Crocker Land and his interesting sledge journeys along the northern coast of our continent.

"Mention must be made, also, of the expedition consisting of Messrs. Marshall, Todd and Murie, which, during the past summer, successfully traversed the peninsula of Labrador from south to north, travelling from the Gulf of St. Lawrence to Ungara.

"Aside from these expeditions there is nothing special to record. The explanation is an obvious one. The strength and zeal of the nations have been devoted to the prosecution of the great war to the subordination of all lesser interests, including those of geographical exploration.

"It is a pleasing reflection in this connection to recall that many men who have won distinction in the fields of geographical exploration have distinguished themselves in the present world struggle. Admiral Peary, by numerous addresses, has helped to rouse the country to the need of aërial preparedness. Sir Ernest Shackleton, I understand, is aiding the cause of the allies in Russia, and that gallant young Englishman, Captain Evans—second in command of the Scott Antarctic expedition whom many of you heard at our Academy of Music meeting—won special distinction by his sea fight last spring against odds near Dover, when he revived the splendid traditions of the British Navy of the days of Queen Elizabeth and Lord Nelson, by successfully repelling a boarding party of desperate German who attempted to capture his ship.

"I need not remind you that the energy and courage which enabled these explorers to overcome the forces of nature in the polar regions have especially fitted them to enter into the conflict against the Teutonic foe.

"In the midst of war's alarms, we shall endeavor to 'carry on' as usual with our Society activities. As a Society, aside from assisting a patriotic cause in one of our excursions and buying some Liberty Bonds, we have not been able to do a great deal for the government; but we have extended an invitation to a number of enlisted men from League Island to attend our lectures, and I hope some of them will be able to accept the invitation, and I can assure these young men that we will be glad to see them here; for the United States Navy is a service we are all proud of, and we feel sure the men of that service will give a good account of themselves in this war as American sailors have done in all others wars they have been engaged in.

"To turn for a moment to our own affairs, I am pleased to announce that during the summer our room in this building has been repainted and a new system of illumination introduced. A most acceptable addition to the adornment of the room, in the shape of a life-size portrait of the late Admiral George W. Melville, has recently been received. This admirable portrait of our late honorary member is the joint gift of Mr. Edward J. Bell,and of Miss Emily and Miss Laura Bell. A most important addition to our map collection has also been received from Washington. It consists of a complete collection of the topographic maps published by the U. S. Geological Survey. I hope our members will not fail to examine these maps when they wish to obtain detailed information not shown on ordinary maps in atlases. We also have on hand, in our library, a very respectable collection of books of travel, and I should be glad to have our members avail themselves more of the privilege of consulting and borrowing these volumes. In conclusion, let me remind you that if the Society is to continue to grow in strength and influence, we must have new members, and the board of directors at their monthly meetings will be glad to consider the names of any candidates you may submit to them."

"IN SEARCH OF NEW ARCTIC LANDS."

BY DONALD B. MACMILLAN.

Donald M. MacMillan, leader of the famous Crocker Land Expedition, addressed the Society on the evening of December 5. His lecture was amply illustrated. Mr. MacMillan returned to the United States in August. During his eight years' absence in the Arctic he traveled 8,000 miles by dog team. He surveyed some 400 miles of coast line and found nine new islands, so that even if Crocker Land was proved a phantom, the expedition returned by no means empty-handed. New mineral deposits, mountains and glaciers were discovered, and valuable data relating to tides, weather, flora and fauna were secured. Relics of exploring parties that had visited the region many years before were shown.

AUTUMN EXCURSION.

On the afternoon of Saturday, October 20, a delightful walk was taken from Ardmore to Wynnewood and the home of Dr. and Mrs. Thomas G. Ashton, where the members of the party were guests at a pageant arranged by the Philadelphia Wellesley Club.

BOOK NOTES AND REVIEWS.

Mills, Enos A. *Your National Parks.* Pp. 531, illustrations, maps. Boston, Houghton, Mifflin Co. 1917. $2.50 net.

Bemis, Katherine S., and Holtz, Matilde. *Glacier National Park, Its Trails and Treasures.* Pp. 258, illustrations and maps. New York, Geo. N. Doran Co. 1917. $2.00 net.

Since the outbreak of the Great War we have seen an unusually large number of books dealing with the scenic features of our own country, especially of the far west. These two books are excellent examples of the growing literature on our national parks that are performing the excellent service of acquainting our people with the scenic attractions of our own land. The book by Enos A. Mills is a comprehensive account of all our national parks and national monuments, and also includes the Canadian parks. Mr. Mills's accounts are born of wide and sympathetic knowledge of the great features he describes so simply, vividly and entertainingly. The verbal account is supplemented by many half-tone illustrations from photographs and by maps and diagrams. The last hundred pages contains a practical guide to the parks by Lawrence F. Schmeckebier, chief of the Bureau of Publications of the Department of the Interior. This guide gives railroad connections, automobile routes, hotels and camps, necessary equipments and costs. The traveler to our west who plans to visit these parks will do well to have Mr. Mills's interesting and helpful book.

The book on the Glacier National Park attempts to do for this one park in a detailed way what Mr. Mills's book has done for all the parks. As a guide book, however, it has not the practical value of the latter. The illustrations are especially beautiful in this book.

Workman, Mrs. Fanny Bullock, and Workman, Dr. William Hunter. *Two Summers in the Ice Wilds of Eastern Karakoram.* Pp. 287, 141 illustrations, 4 maps. New York, E. P. Dutton & Co. 1917.

In this sumptuously illustrated volume the joint authors have narrated their experiences and discoveries on two summer compaigns in the Karakoram mountains of Kashmir—extending north of and parallel with the main range of the Himalaya. In previous volumes these adventurous American alpinists have recounted their achievements on earlier expeditions in the same general region, and the present work rounds out a period of fifteen years devoted to explorations in this difficult and inaccessible region.

Departing from Shrinagar in June, 1911, the European members of the expedition, aside from the principals, included two topographers and an Italian guide and three porters recruited from Courmayer. As the party advanced into the mountains, supplies and equipment were transported by coolies supplied by the Rajas of the various districts traversed, and, on one occasion, twenty sheep were driven to one of the base camps to supplement the camp larder. After devoting some weeks to the examination of the Masherbrum and other glaciers, the explorers succeeded in reaching Bilaphond La or Saltoro Pass (18,370 feet) whence they viewed the Siachen Glacier. Returning to the same region in 1912, our travelers examined the great Siachen or Rose Glacier throughout its entire length, discovered and ascended its north and east sources and investigated the relation of the eastern Karakoram-Indus watershed to that of Chinese Turkestan at those points. The main ice stream was mapped and many of the important peaks triangulated. On this great plateau of central Asia rise some of the loftiest peaks on the globe, and many of these are shown in the illustrations which maintain a high standard of excellence. The book depicts characteristic phases of camp life and climbing—tragic and grotesque—and contains interesting observations on the effect of high altitudes on the human frame. The narrative shows that Dr. and Mrs. Workman are animated by a commendable desire to secure accurate results by adhering to scientific methods in all their mountain explorations. The undoubted value of the scientific results obtained on their various expeditions has given them a foremost place among cultivators of mountain craft; and one can only regret that they were not content to rest on their well-earned laurels rather than to inject a controversial spirit into their present narrative.

H. G. B.

Williams, John H. *Yosemite and its High Sierra.* Pp. 149, map, illustrations. Tacoma, J. H. Williams. 1914.

This superbly illustrated account of the Yosemite National Park possesses the same high qualities as the previous books by the same author on other portions of the western mountains. As a guide book for the prospective traveler or as a souvenir for the fortunate travelers who have visited Yosemite, this little volume is most welcome. Its pages are filled with the most wonderful photographs that have ever been collected of the mountain scenery it describes. In addition to the plain pictures, it contains eight four-color plates from paintings by Chris Jörgensen.

Fordyce, C. P. *Touring Afoot.* Pp. 666, diagrams. New York, Outing Publishing Co. 1916. 80 cents net.

Another little book in the Outing series of text-books for outdoor work and play, which gives practical suggestions on tramping. Such topics as packs and packing, footwear, the lightweight mess kit, health hints, which constitute the chapter headings, indicate the nature of the book. It is a book designed for the amateur, rather than the seasoned tramper.

GEOGRAPHIC NEWS AND NOTES.

The expedition of the National Geographic Society to Mount Katmai reached Seattle September 30. Dr. Robert F. Griggs, of Ohio State University, is head of the expedition.

A telegram to Dr. W. J. Holland, director of the Carnegie Museum at Pittsburgh, announces the arrival at St. John's, N. F., of the expedition which started last April from the Bay of Seven Islands on the Gulf of St. Lawrence for Ungava, on Hudson Strait. The expedition succeeded in crossing the peninsula of Labrador from the south to the north. It was financed by the Carnegie Museum, the National Geographic Society and Alfred Marshall, of Chicago, a member of the party. With Mr. Marshall were W. E. C. Todd, curator of ornithology in the Carnegie Museum, and O. J. Murie, curator of mammals. They took a number of Indians.

Associated Mountaineering Clubs of North America.—In May, 1916, nine clubs and societies with common aims associated themselves in a Bureau with headquarters in New York. The membership now numbers nineteen, comprising about 16,000 individual members.

Among the common aims, aside from the exploration and mapping of mountain regions and the ascent of leading peaks, are the creation, protection, and proper development of national parks and forest reservations, the protection of bird and animal life and of trees and flowers. Many of the clubs and societies issue illustrated publications on mountaineering, exploration, and conservation of natural resources, and are educating their members by means of lectures to a deeper appreciation of nature.

The Bureau publishes an annual Bulletin giving the officers, membership, dues, publications, lantern slide collections, outings, and other matters of interest of each club. Data on mountains and mountaineering activities is supplied in response to inquiries.

Acquaintance with the literature of a subject is essential to efficient work in the field, and the Bureau sends many important new books on mountaineering and outdoor life to its members free of charge. A large collection of mountaineering literature has been gathered in the central building of the New York Public Library and the American Alpine Club has deposited its books therein, providing a permanent fund for additions. A bibliography of this collection has been published by the library. An extensive collection of photographs of mountain scenery is being formed and is available to anyone wishing to supplement the literature of a region with its scenery. LeRoy Jeffers is Secretary, and is librarian of the American Alpine Club, 476 Fifth Ave., New York.

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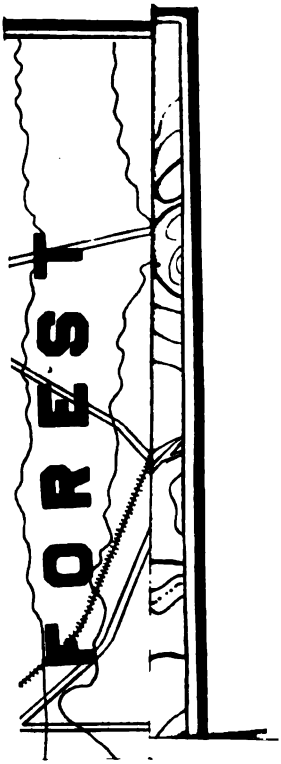

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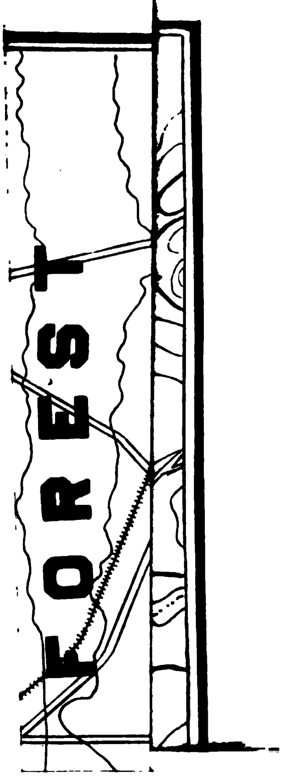

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THE GEOGRAPHY OF CERTAIN RUINS NEAR THE SAN FRANCISCO MOUNTAINS, ARIZONA.

HAROLD SELLERS COLTON, PH.D.

UNIVERSITY OF PENNSYLVANIA.

Among the various kinds of ruins found on the plateau region of our Southwest are certain inconspicuous ones of ancient appearance, which have long been known to archeologists as small house ruins, a name given to them in contrast to the remains of large communal dwellings or pueblos which exist throughout the same territory. Notwithstanding the fact that much study has been given to ruins of pueblo-like structures, these smaller houses have been neglected. Although nearly every archeologist who has worked upon the high plateau of New Mexico and Arizona has commented upon them, yet one and all have passed them by for some conspicuous pueblo ruin in the neighborhood. So faint are the traces and so little regard has come from them in the way of "trophies" that archeologists as well as curio hunters have almost entirely ignored them.

It was early pointed out by Bandelier and now generally accepted that the small house is ancient, antedating the building of pueblos. They are often represented as being the ancestral homes of the various clans that went to form the true pueblo. Not only is the indirect evidence available which led Bandelier to this conclusion, but recently direct evidence has been forthcoming. It must be mentioned that associated with the small house ruin are potsherds of a fine-grained gray ware with black geometrical designs on a white slip. Except for the remains of corrugated cooking pots no other type of decorated pottery is abundant. In New Mexico we know by the careful excavations of Nelson (1916) in the Galisteo Basin and of Kidder (1916) at Pecos that this black and white pottery is the only kind found at the bottom of certain ancient refuse heaps and therefore the making of this antedated the making of all the other kinds. Nelson at the same time has shown that the black and white pottery from the refuse heaps is similar to that of some small house ruins near Santa Fe. As the black and white potsherds from the western area are exactly similar to those of the eastern area, without direct evidence, it can be assumed that they are of similar age. It is reasonable then to draw the conclusion that at some time antedating the building of large communal dwellings the high plateau of New Mexico and Arizona was inhabited by a people of pueblo culture who dwelt in small isolated houses. To picture the conditions under which these small house dwellers lived is the subject of the present study.[1]

The Ruins about Flagstaff.—As this is essentially a study of an extinct people to their environment, both physical and organic, it will first be necessary to consider the visible remains of the people and later examine the physical and organic factors that have acted upon them. The region with which we are concerned is a very limited one. It extends from the Dry Lake Hills and Elden Mountain, outlying masses of the San Francisco peaks, south to Walnut Canyon and east from Flagstaff to Turkey Tank and Winona, an area of some two hundred square miles. On the whole this was explored in a very superficial way, nevertheless eight square miles were combed with such care that nearly all the antiquities have been recorded (see map).

In this region two kinds of small house ruins have been found. The first type is characterized by large rooms (average 250 square feet) which are hardly ever more than three in number. Into the construction of these little stone seems to have entered. In consequence of this fact the sites are indicated by rows of boulders without an accompanying mound. This type of ruin has been referred to by Mindeleff (1896) as "boulder sites." Associated with these sites are the black and white decorated potsherds common to the small house ruins. With these one is apt to confuse certain temporary farm shelters of later date which, however, are very small and are associated with a black and red pottery.

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[1] The author wishes particularly to thank the United States Forest Service, the United States Weather Bureau, Mrs. Mabel Hodges, of Flagstaff, who with many others furnished information which has been embodied in the maps and tables in this paper. Special credit is due to my wife who assisted in the exploration of all the ruins.

PLATE 1. THE SITE OF PUEBLO 60, looking south, located just west of Elden Spring.—"A boulder site."

PLATE 2. THE SITE OF PUEBLO 124, looking north. This is a pueblo of the second class, located just east of Switzer's Mesa.

PLATE 3. VIEW OF THE SAN FRANCISCO MTS. FROM THE DESERT OF THE LITTLE COLORADO.

PLATE 4. A VIEW LOOKING EAST FROM THE OLD CAVES HILL PUEBLO RUIN. Below is Doney Park and in the background volcanic hills.

In the second type of small house ruin the rooms are smaller (average 150 square feet) but the number of rooms is often up to ten. A house of many rooms is usually the center about which a number of other one-roomed houses are grouped. All of these houses were built of stone and the sites, in contrast to the boulder sites, are marked with piles of stones often many feet high. Red and black potsherds are almost as abundant as the black and white. Some of the rooms apparently had underground chambers constructed beneath them. The single rooms are too small to be considered as anything like a kiva or ceremonial chamber, being often as little as eighty-one square feet.

Corresponding to the two types of small house ruin are two types of pueblo ruin. The first is a "boulder site" like the first type of small house, of ancient appearance and with black and white pottery predominating. The rooms are large, many around four hundred square feet (Pueblo 60). The second type are often constructed on easily defended sites and in every way correspond to the second type of small house. In this type many of the rooms are associated with an underground chamber, the position of which is determined by the character and contour of the ground out of which they were excavated. In the Old Caves Pueblo (72) and on the north and west slope of New Caves Mountain (8) they were excavated as cellars. Where the hillside was sufficiently steep as on the east face of New Cave Mountain (8) and Turkey Tank Caves (117) the rooms were dug into the hill on the same level with the built-up rooms. Some were built near water and arable land and without thought of defense. Others were built away from water, near the fields and on hill tops (72, (8)). Still others are built near water, on sites easy to defend, but away from the fields (Walnut Canyon Cliff houses). There must have been a variety of conditions that would make each one of these sites be the best available.

Not only are there found small house ruins, but there are also found several forts. One of these is on a hilltop associated with a pueblo, another is on a hilltop (Fortress Hill), associated with a few small houses of the first class and the third is on a neck of land on the side of a canyon, Turkey Tank. In these forts the accessible approaches are guarded by high walls, often several feet thick.

Besides those sites, recognizable as building sites, there are others—centers of abundant potsherds—but on which there are no boulders or any sign of a mound. These are probably the remains of temporary shelters built of wood and thatched with cornstalks which overlooked a patch of corn.

We have the following classes of ruins:[2] (1) Small houses, first type; (2) small houses, second type; (3) pueblos, first type; (4) pueblos, second type; (5) forts; (6) farm shelters.

Physical Environment.—The physical environment depends upon the character of the earth's surface and the climate. The interaction of these two factors determine what food is available, where water may be found, what material can be produced for the building of shelters and the making of clothing. When we study this region we find that it is a gentle sloping limestone plain dropping off to the east a little less than a hundred feet to a mile. On this plain is reared a host of volcanic cones culminating north of Flagstaff in the San Francisco peaks, 12,700 feet above the sea and over five thousand feet above the plain (see Fig. 1). Elden Mountain is an extruded mass of igneous rock. The surface of the ground, except for a few exposures of limestone and lava rock, as a whole is covered by sandy and gravelly deposits. To the east of the Grand Canyon Road the limestone table is overlaid with volcanic ash, lapilli, scoria and bombs. The sum total effect of these conditions is that the land table is porous to water. The limestone with its caves, the fissures through which the volcanic material reached the surface, and the sandy nature of the soil prevent any running streams being found. The water from the few existing springs is soon lost in the porous soil. This lack of surface water is not peculiar to the Southwest and is not remarked upon in this region. However, it is remarkable since here is ample rainfall. An annual rainfall of

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[2] Although Fewkes (1904) and a few others have described the major ruins in this region embracing the large pueblos on Old Caves Hill (72), New Caves Mountain (8), Turkey Tank (142), and the cliff houses at Walnut Canyon, yet the author was able to discover the sites of over one hundred more. On these sites had been built small houses, pueblos, temporary summer shelters and forts (see map). These are described in a forthcoming paper in the *American Anthropologist*.

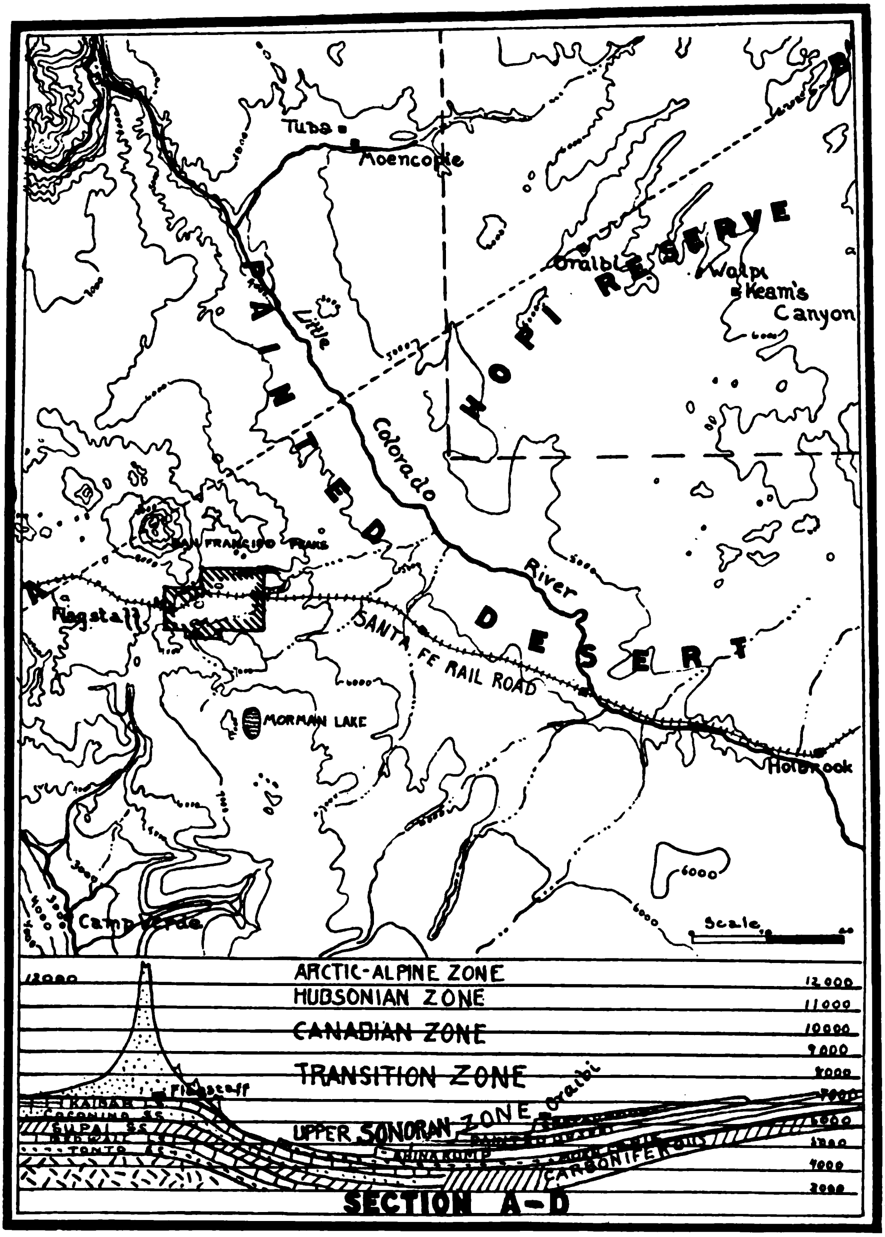


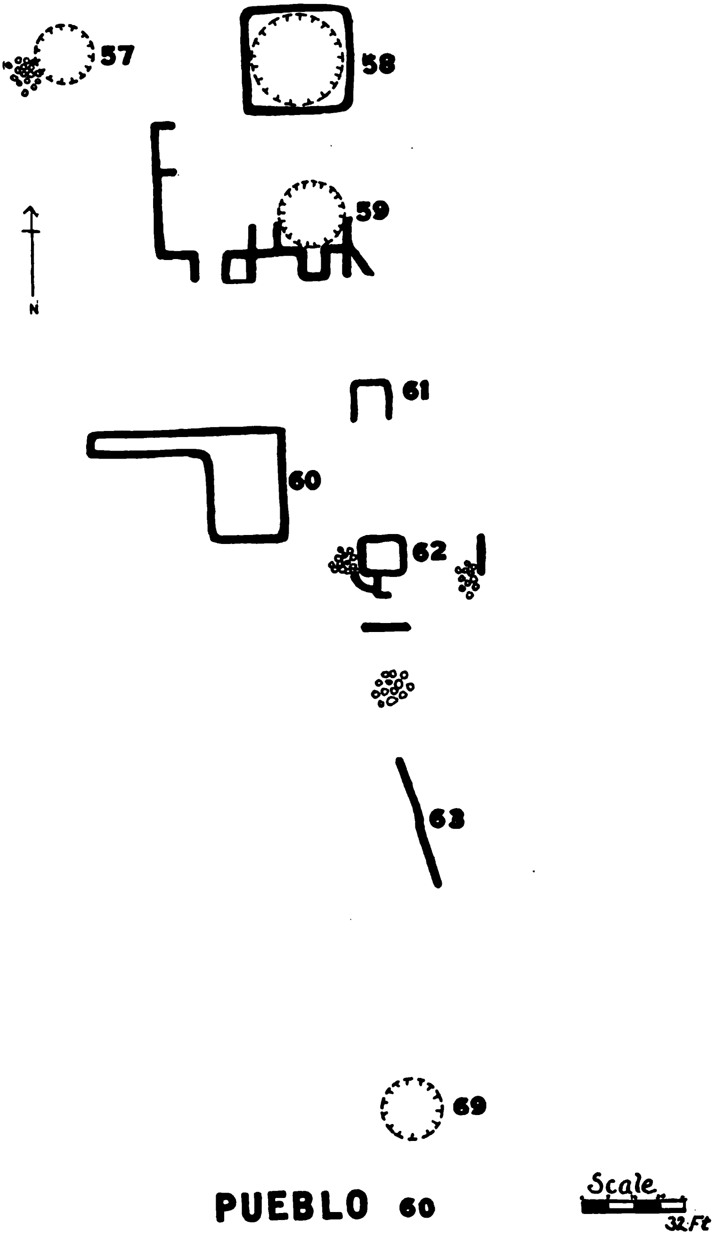
Fig. 1. Map showing a Portion of Northern Arizona. The region included in the present study embraces the cross hatched area. The railroad is the main line of the Sante Fe. After Darton, 1910.

twenty inches in other regions would produce running streams but here the porous soil absorbs it all. The Rio de Flag draining an area of some two hundred and seventy square miles is dry nearly all the year. Oak Creek, eighteen miles south and two thousand feet lower, draining but sixty to seventy square miles, has an abundant supply for all the year. The latter is fed by many springs which receive their supply of water from under the rest of the plateau.

What little water is to be found is either in a few springs—five in number close to the base of the mountains—or in natural tanks in the bottom of Walnut Creek. The springs are associated with the solid rock of Elden Mountain. The tanks are located in the bed of Walnut Creek because it is the only stream that has cut through the limestone into the underlying sandstone. Turkey Tank however is an exception and its basin is made water tight by Walnut Creek cutting a channel over a lava flow. The two most notable springs are Elden Spring (37) and the spring on the northeast flank of Elden Mountain (141) These are small springs, but they have never been known to go dry. In ordinary years the natural tanks in Walnut Creek hold water throughout the year. That these springs and natural tanks were used by the primitive inhabitants of the region is testified by the vast number of potsherds found thereabout.

In recent years artificial tanks, cisterns and wells have been constructed by ranchers, sheepmen and the government throughout the region studied. Some artificial tanks hold water for as much as eight months of the year. Where the soil contains some clay there is no reason why the primitive inhabitants could not have constructed similar tanks on the same sites. Casas 78, 79 and 55 are near such a modern tank. Cluster 75 is near Power's tank in the Rio de Flag. Old Caves Hill pueblo is but a mile southeast of Mason's tank and a government tank.

Over Doney Park, which is largely given up to cultivation, the soil is too porous for the construction of tanks. Here some concrete cisterns have been built by the ranchers; a form of reservoir that could not be duplicated by primitive man. Although a number of wells have been dug in the region of Doney Park, yet there is only one that holds water for more than a few months of the year.



PUEBLO 60

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This well is thirty-five feet deep. Two wells of fifty and eighty feet depth hold water part of the year. Other wells from thirty to seventy feet deep are always dry. Since it is extremely doubtful that primitive man with the tools at his disposal would have or could have dug so deep for water it is equally improbable that the underground water was available to him.

Two ranchers were homesteading in the western end of Gourd Flat in the summer of 1916. Both hauled their water. One was putting down a well in the bed of the Rio de Flag, but had not struck water. In the summer of 1916 there was only one rainstorm here as far as the writer knows that caused a runoff. This one storm, which was of the nature of a cloud-burst, washed out a tank which had just been constructed in the bed of the Rio de Flag at the entrance to the small canyon north of Fortress Hills. Although there were a number of other rains the porous soil absorbed all the water that fell. Considering that about Gourd Flat are evidences that at one time it supported a large population—in fact next in magnitude to Walnut Canyon—it is at the present time the region with least water. It is six miles east, west and south to anything like a permanent supply.

When we study with great care the distribution of all the sites as can be done only in a circumscribed area such as south of Dry Lake Mountain and south of Elden Mountain and when the ruins are plotted, we see that no one is over a mile and three quarters from a permanent spring. Even then those farthest away are close to the site of a modern tank (Tank 147). Most of the ruins are grouped close about the spring. We would be led to conclude therefore that the builders of these houses and towns would not go much over a mile for water.

When we study the situation of modern pueblos we notice that all are located near some permanent natural source of water, be it a spring, creek or river. If we notice the conditions at the Hopi towns, as an example, we find each one associated with a spring or several springs. As these towns are located on mesa tops and the springs are often a mile or so away near the base of the mesa, the Indians, where possible, construct on the mesa close to their towns, artificial reservoirs to which they conduct a portion of the runoff of the mesa by properly constructed channels. A large part of the year these tanks contain water. During the balance of the year the Indians must travel a mile or two for water. One factor determining the location of a modern pueblo is clearly, therefore, a nearby permanent source of water.

A brief survey of the region in question when taken in connection with the distribution of the ruins and the conditions found among existing Pueblo Indians, leads us to believe that primitive man in this region never built a permanent home far removed from a source of potable water. It is probable that for water he was not dependent solely on springs and natural pools, but where the physical character of the ground was satisfactory and when the rainfall was ample he was able by constructing artificial reservoirs to supplement the natural supply. It was thus possible for him to make a permanent home in a naturally waterless region.

Many archeologists have noted how the environment has affected the architecture of the Pueblo Indians. Fewkes (1906) has shown that as a rule the buildings face to the south and southeast in order to take advantage of the sun. Hewett has attributed the small size of the rooms of the pueblos on the Jemez Plateau in New Mexico to the extreme cold of the winter. In a similar way the environment has affected the architecture in this region. The pueblos all have a southern exposure, but the size of the rooms does not seem to be directly influenced by the temperature. This region is as high as the Jemez Plateau, and we have no reason to doubt that the winter is as severe, yet if we examine the rooms, we find that they are very large. If we compare the room sizes in the higher portions of this region with the room sizes in the lower part we discover that the higher regions have the larger rooms (Table I).

TABLE I

SIZE OF ROOMS IN SQUARE FEET

Alt.	Regions.	1–100.	100–200.	200–300.	300–400.	400–500.	500–1,000.	No. Rooms.	Mean.
7,000 ft.	Switzer and Eldens Parks	4	8	10	8	1	1	32	231 sq. ft.
6,500 ft.	Doney Park and Gourd Flat	12	18	3	1			34	129 sq. ft.
6,000 ft.	Fortress Hills and Turkey Tk.	1	12	2		1		16	150 sq. ft.

In the higher portions long rafters of yellow pine were more easily procurable than in the cedar and piñon forest below. However, there are in the lower cedar and piñon forest rooms nearly as large as those about, Elden Spring.

Unless we assume that climatic conditions were so different that the yellow pine zone reached lower than at present and at the same time the winters were milder, two ideas that conflict, we must conclude that there were adaptations to the cold winter other than room size. This is a region of forest and fire wood is plentiful. If the population was small, large amounts of fuel could be collected close at hand and large fires could be maintained by the scattered dwellers in the large-roomed small houses of the first class. The small-roomed houses and pueblos of the second class represent a much denser population. The gathering of wood would be a serious factor in the economics of the people. In these days of steel axes and burros it is an important problem for a pueblo people to handle. What was it to ones with stone axes and without beasts of burden? The availability of fuel is then probably a factor in the size of the rooms.

In the matter of building material the most convenient substance at hand seems to have been used. Where good flat stones were available they were used. If the stones were irregular as are the lava blocks of this region, and if they are far away, then the builders seem to have resorted to wood or adobe. Although many of the houses are now represented by piles of stone several feet high which testify to the method of construction, yet others are mere rows of stones outlining rooms on the forest floor. Notwithstanding that considerable quantities of potsherds are found on such sites, indicating long habitation, nevertheless on excavating such a site not enough stones were recovered to build walls three feet high. In this case it is not likely that the ruin had been robbed to build a more recent house. The nearest house using stone in its construction was over a mile away and close to the mountain with its inexhaustible supply of material. Some sites away from a convenient source of permanent building material seem to have used little or no stones in their construction. These sites are now represented by a center of abundant potsherds with or without a mound. If we may make an analogy with the existing Hopi it would seem that many of these were sites of summer shelters built of wood, thatched with cornstalks and located to overlook the fields. It is reasonable

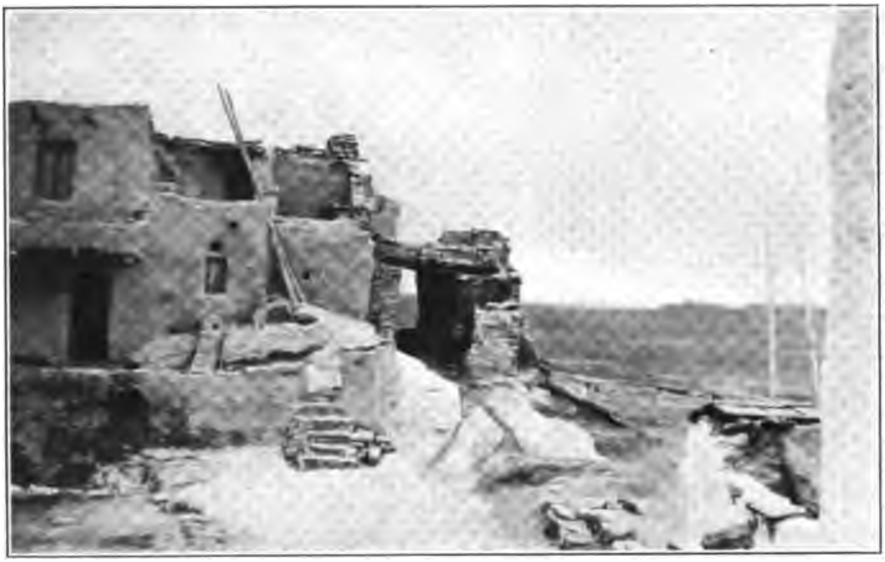


Plate 6. The Hopi Pueblo of Walpi.

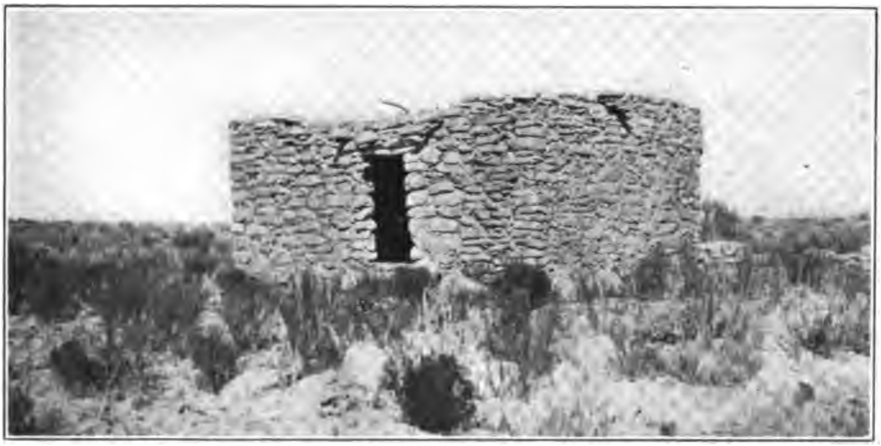


Plate 7. A Small House Built by Modern Indians (Hopi).
A temporary residence overlooking the fields.

PLATE 8. TURKEY TANK, a natural reservoir, five miles north of Winona Station, on the Santa Fe Railroad.

to suppose that the people dwelling in this open forest constructed their houses of the material nearest at hand.

TABLE II

Station.	Floral Zone.	Altitude.	No. Storms July and Aug.	Days Between Frosts.	Mean Temperature July and Aug.	Cloudiness July and Aug.	Inches of Rainfall July and Aug.	No. of Days Jul. and Aug. with			Remarks.
								Over .01 in.	Over .1 in.	Over .5 in.	
Fort Valley, Ariz...	Transition	7,500	1	105	60.2	65%	5.3	28	16	3	Dry farm
Flagstaff, Ariz......	"	6,900	1	105	63.2	50	6.6	27	16	4	" "
St. Michaels, Ariz...	Forest Phase of Upper Sonoran	6,950	1	102	68.1	50	4.4	17	13	3	" "
Black Rock, N. M..	Forest Phase of Upper Sonoran	6,455	1	?	69.9	47	5.0	24	11	2	" "
Sante Fe, N. M....	Forest Phase of Upper Sonoran	7,037	1	127	67.3	47	5.7	26	9	2	" "
Keams Canyon, Ariz.	Forest Phase of Upper Sonoran	6,600	1	102	70.0	30	4.1	17	11	3	" "
Holbrook, Ariz.....	Desert Phase of Upper Sonoran	5,000	1	139	75.0	23	5.2	14	11	3	Irrig.
Tuba City, Ariz....	Desert Phase of Upper Sonoran	4,500	6	155	75.2	40	2.2	17	7	1	"
Leupp, Ariz........	Desert Phase of Upper Sonoran	4,100	1	?	74.0	30	2.3	?	?	?	"
Central Maine.....	Canadian	200	71	130	64.8	57	6.7	18	17	5	Dry farm
Bismarck, N. D....	Transition		59		71.4	41	4.1	20	11	3	" "
Philadelphia, Pa....	Upper Austral	100	37	160	75.5	54	9.6	22	13	6	" "
Dodge City, Kan...	" "	2,480	34		82.8	45	6.3	15	10	3	" "

A study of the sites indicate that several factors entered into their selection. Each site may be said to represent the resultant of four forces. Proximity to the fields was balanced by the accessibility to the water supply. It was necessary to overlook the fields to keep off marauders, but one must have water to drink. In the best studied region, one and three fourths miles seems to be the limit one would go for water, as the map shows. On account of heavy rains it is necessary to build on a slight rise, even if it be but a foot or two above the surrounding plain. This is a factor considered by anyone who select a camp site, be he primitive or civilized. As soon as this factor was recognized it became much easier to find the ruins,—one had but to seek out the higher and best drained locations. Although no thought of defense seems to have entered into the minds of those who chose the great majority of sites, yet there are others in which defense was the paramount factor in the choice. Water supply and nearness to the fields were given up that the site might be easily defended. Not only are such places difficult of access, but they are protected by specially built walls forming forts. Sometimes a fort served only as a place of refuge in time of stress. Such a fort is found on the Fortress Hills. This must have had much the same relation to the inhabitants of the neighborhood as the block house did in the early settlement of this country by Europeans. On the other hand we have represented in this region another type of fort; a fort with which dwelling houses were closely associated. As an example of this class one can name the fort and pueblo on New Cave Mountain. Here we have a case not unparalleled by the medieval castle in Europe. Access to water, nearness to the fields, drainage and sometimes defense,—all were factors entering into the selection of a site.

Organic Environment.—Not only does the climate affect the water supply but it also affects the organic environment, particulary in the production of food. In the matter of food supply these people show every evidence in their remains of having a culture similar to such Pueblo Indians as the Hopi or Zuñi. This is directly borne out by the character of the pottery and the occurrence of metate stones and manos in the ruins. We conclude then that these were an agricultural people, Indian corn being their staple food which was supplemented with beans, squash and the products of the chase. This supposition is abundantly verified. No ruins are far from land that could be cultivated as can be seen on map. The nearby mountains must have supplied the necessary game. As game is never plentiful enough to supply a sedentary population with food we must conclude that it played only a small part in the diet of the people. When on agriculture depends the necessities of life, then slight variations in climatic conditions often means famine or plenty.

The climatic factors which have most effect on the growth of crops without irrigation are: (1) Length of growing season, *i. e.*, the period between the last frost in the spring and the first frost in the fall, (2) amount of rain in the growing period, (3) distribution of rains in the growing period, (4) temperature, and (5) amount of sunshine.

As there is great popular misconception concerning the climate of the plateau of Arizona it will be necessary to review briefly the conditions found in different seasons of the year. There is a winter season of cyclonic storms from November to March. As the altitude is between six thousand and seven thousand five hundred feet the precipitation, which amounts to some twelve inches, is largely in the form of snow. This is followed by a clear dry spring with warm days but cold nights. There is frost until the middle of June. In July clouds appear and by the middle of the month the days are in a large part cloudy with violent thunderstorms. Flagstaff ranks third in number of thunderstorms in the United States, being surpassed by Tampa, Florida and Santa Fe, New Mexico. So frequent and of such long duration are these storms that the number of pine trees that have been struck by lightning is very large. Liebig (1904) mentions that on the lava fields and cinder cones east of the San Francisco peaks fifty per cent. of the trees have been struck by lightning. South of the peaks the author made some counts of trees which showed that in various places seven and three tenths per cent., eight per cent., eight and seven tenths per cent. and thirteen per cent. had been struck. The result of the accompanying rains is that between six and seven inches of water falls and it is a very cloudy period (sixty per cent.). On account of the generally cloudy weather in July and August the extremes of temperature are not so great in the whole as June. The nights are warmer and the days are cooler. In September the rains become less and the summer rainy season merges into the cyclonic period of the winter. The autumn is on the whole clear but rains are apt to occur.

If we neglect the spring dry period, in certain other factors on which agriculture depends, the climate of July and August is not unlike that of central Maine. At Flagstaff by the end of June the water from the winter snow ceases to be available and the success of field crops is dependent on how early in July the first heavy rains occur. When the capillary films about the soil particles are relpaced, the underground moisture then becomes again available. After that very light showers suffice to restore the film and insure a crop. Owing to the very short period between frosts and the spring drought maize does not always mature. The lack of surface water for irrigation and the short growing season form the chief difficulties to the farmer.

There is every evidence that the local variations in climate are very great. Two stations quite near together may have very different climates. What has been said of the weather at Flagstaff may not apply to regions ten miles away. The chief cause of these local differences of climate is altitude and proximity to the mountains. Since maize of ordinary varieties does very much better at Doney Park (six thousand seven hundred feet altitude) than at Flagstaff (seven thousand feet altitude), although there are no records to support the view, there seems to be more sunshine in the former locality than the latter. With the increase in sunshine there must be a slight decrease in rainfall. This climatic difference becomes more evident the further we go from the mountains. At Turkey Tank (six thousand feet) the rainfall is so reduced that corn of ordinary varieties are impossible to grow and Hopi corn with its drought-resisting habits of growth may even be a failure. From Turkey Tank to the Little Colorado River the aridity increases to such an extent that agriculture without irrigation is impossible. It is evident therefore that a knowledge of the climatic factors in one locality cannot be applied unreservedly to another station, no matter how near by.

Although there are no available records for the climatic conditions between Flagstaff and the Little Colorado River, yet we are able to determine something of those conditions from a study of plant formations. We can do this (1) because on the plateau of Arizona and New Mexico certain formations occur over a wide area, (2) these are distinct from one another, (3) soil and exposure being equal, climatic factors have much to do with their distribution, and (4) somewhere in each plant formation weather records have been kept.

Merriam (1889) in his classic report on the life zones in the San Francisco Mountains recognized the relation of the climatic factors to these well-marked plant formations. In general these formations are distributed in zones following with certain well known exceptions the lines of equal altitude. The broad treeless valley of the Little Colorado River, better known as the Painted Desert, falls in the Upper Sonoran Life Zone. However, it is only below the 5,500-foot contour that the zone is treeless. Between 5,500 and 6,500 feet there is the very striking cedar-piñon formation characterized by a sparse growth of the nut pine (*Pinus edulis*) and the cedar (*Juniperus occidentalis monosperma*) associated with the sagebrush (*Artemesia tridentata*). Although agriculture in the desert part of the zone is possible only with irrigation, in favorable situations as to soil conditions in the cedar-piñon formation, Hopi maize, beans, and squash may be grown by the methods of dry farming (Table II). Between 6,500 and 8,000 feet are the forests of the western yellow pine (*Pinus ponderosa*). The distribution of this fine forest tree marks the extent of the Transition Zone. In this zone the American rancher cultivates potatoes, oats and a little corn by the methods of dry farming (Table II). Although the Canadian, Hudsonian and arctic-alpine zones are found on the San Francisco Peaks, as neither agriculture is practiced nor are ruins to be found, it is therefore unnecessary to consider them here.

The region included in this study has been for the sake of convenience broadly divided into five districts: (1) South and east of Elden Mountain (six thousand eight hundred to seven thousand five hundred feet) which we call the Elden district; (2) east of Elden Mountain (six thousand seven hundred to seven thousand feet) which we will call the Doney Park district; (3) the transition of the Cedar Zone and the Yellow Pine six thousand five hundred feet which we will refer to as Gourd Flat; (4) upper Walnut Canyon ✓ which includes the Cliff Ruins; (5) lower part of Walnut Creek (six thousand feet) which we will refer to as Turkey Tank. In all these districts ruins of one kind or another exist.

All of the ruins studied have a certain relation to arable land as well as to a probable source of potable water, to drainage and in some cases to ease of defense. It is a striking fact that all ruins are found within a short distance of arable land. The presence of water unassociated with such land did not attract people of pueblo culture. At the head of Walnut Canyon is a natural tank—Fishers Tank. No potsherds were found anywhere in this neighborhood even down Walnut Canyon a mile or more. In the canyon a cave was discovered in the sandstone wall. Eighteen inches under the present floor charcoal was found as well as bones of the Virginia deer, a tibio-tarsus of a large bird and with them one obsidian chip. No potsherds of any kind were encountered. Although five miles down the canyon, a large population of pueblo culture once dwelt under the rock ledges, at the upper end of the canyon, where there is no nearby arable land, only wandering hunters occupied the caves.

In the Elden region it is easy to account for the water supply but it is not easy to account for the fact that a population using maize as a staple food could exist there under the present climatic conditions. At present maize is very little grown because it rarely matures. As far as the experience of the writer goes no Pueblo Indians are farming in the transition zone. All are either cultivating their crops in the cedar-piñon zone by dry farming or in the lower part of Upper Sonoran Zone by irrigation. This does not exclude the fact that Hopi maize would not do very well about Flagstaff. That it is not grown by the farmers in this region when it is grown by them twenty miles east at Turkey Tank is some evidence that it does not thrive. Although a few direct experiments at Flagstaff might reverse any conclusions that we would draw from this data yet there is evidence that corn does not do well in the Elden region under the present climatic conditions.

We have seen that in two places in this region the optimum conditions for human life with pubelo culture do not exist. The Elden region is too cold and cloudy for the best growing of maize and the Gourd Flat region is without drinking water, yet both of these regions once possessed a fair sized population. Taking many factors into consideration for those who choose the sites they must have been the best available in the neighborhood. Either all the better sites were occupied or climatic conditions were different. A study of this region will not let us solve this problem.

Climate of the Past.—Until recently the theory of climatic pulsations was on such insecure formations that American archeologists felt on safe ground only when they assumed an unchanging climate for the arid parts of North America. It will be needless here to repeat the various ways that they justified their stand from Bandelier's famous hidden spring to the migration myths of modern Pueblo Indians. In recent years, however, many investigators have independently contributed evidence on this subject. We have evidence from the history of southern Europe and Asia (Huntington). We have it from the physiography of arid regions in both the old world and the new (Huntington and Robinson). We have evidence from archeology (Huntington and Hewett). We have evidence from the growth of trees (Douglas and Huntington) and finally evidence from a study of plant ecology (Henderson). The summation of all these different lines makes the theory of climatic pulsations become the doctrine of climatic pulsations.

The writer is not going to try to justify this doctrine from the evidence at hand. Ruins in the Beaver Valley to the south or ruins in the Painted Desert to the northeast furnish much better material for the purpose. Instead he is going to try to fit the conditions found about Flagstaff to the climatic conditions that have been deduced by Huntington and Douglas from a study of annual growth to the yellow pine at Flagstaff and the trees in California.

The climate of the past in Arizona has been determined as follows:

1. Douglas found in a study of the width of the growth rings of the yellow pine trees at Prescott, Ariz., were correlated with the annual rainfall.

2. He was able by such a study to roughly estimate the annual rainfall in the years preceding the keeping of records.

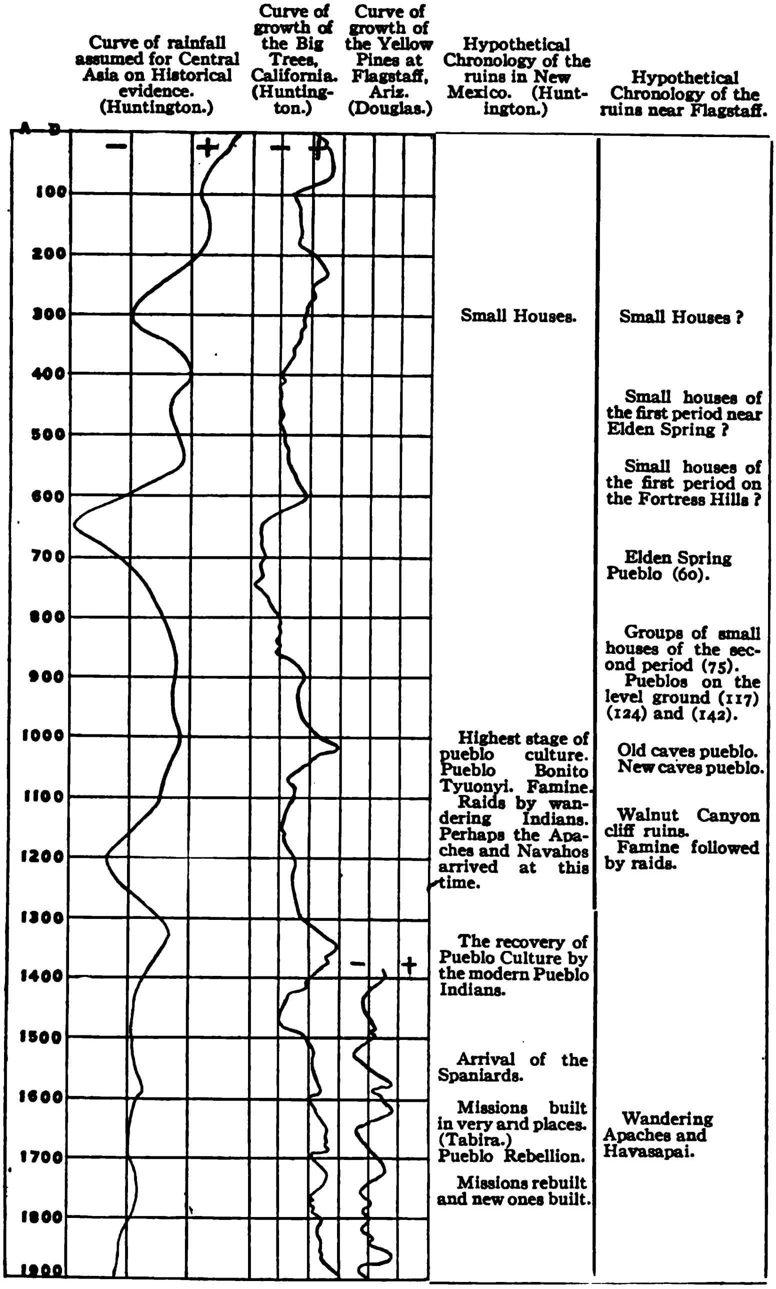
3. By studying in a similar way the trees at Flagstaff, Ariz., where the trees are older, he was able to plot the rainfall back to the year 1385 A.D.

4. Douglas and Huntington continued these studies to the big trees in California and by the same means estimated the relative rainfall in California back until about B.C. 1300.

5. From historical sources and from a comparative study of trees in other parts of the world Huntington has shown that the major variations are world wide. Thus we can consider the major fluctuations in California to have a counter part in Arizona.

6. Huntington has tentatively dated the various types of ruins found in the southwest. This is largely speculation but is interesting to direct attention to the problem.

When we come to plot our own material in chronological order (Fig. 2) we find we have two main periods to consider, the early small house period and a later pueblo period. The small house ruins about Elden Spring are so like those found on other parts of the plateau that there is every evidence that they all belonged to the



Hypothetical Chronology of the ruins in New Mexico. (Huntington.)

Small Houses.

Highest stage of pueblo culture. Pueblo Bonito Tyuonyi. Famine. Raids by wandering Indians. Perhaps the Apaches and Navahos arrived at this time.

The recovery of Pueblo Culture by the modern Pueblo Indians.

Arrival of the Spaniards.

Missions built in very arid places. (Tabira.) Pueblo Rebellion.

Missions rebuilt and new ones built.

Hypothetical Chronology of the ruins near Flagstaff.

Small Houses ?

Small houses of the first period near Elden Spring ?

Small houses of the first period on the Fortress Hills ?

Elden Spring Pueblo (60).

Groups of small houses of the second period (75). Pueblos on the level ground (117) (124) and (142).

Old caves pueblo. New caves pueblo.

Walnut Canyon cliff ruins. Famine followed by raids.

Wandering Apaches and Havasapai.

FIG. 2. ASSUMED CORRELATION BETWEEN CLIMATIC CYCLES AND THE RUINS IN THE PLATEAU OF ARIZONA AND NEW MEXICO. Compiled from Huntington's "Climatic Factor in Arid North America."

same general epoch. If the period which followed is correlated with the period of maximum development of pueblo architecture as is represented in New Mexico in the Jemez region or in Chaco Canyon then there seems to be a thinning out of the culture from the east in New Mexico to the west in Central Arizona. Although the pottery is similar to the pottery found in the San Juan valley yet here there is no evidence that there were circular underground ceremonial chambers either estufas or rectangular kivas. There seem to have been, however, large ceremonial chambers on the surface of the ground as one finds at Zuñi or associated with ruined pueblos in the Verde Valley which again is not far removed from the condition in the Gila drainage. On the whole, as Fewkes (1900) has pointed out, the people of the pueblo epoch about Flagstaff seem to have been intermediate in culture between that found in the south and that to the north and east.

From the condition of the ruins and the general state of society that those ruins represent we can make a rough correlation between the remains hereabout and the ruins in New Mexico. When we try to fit them to Huntington's curve we run upon difficulties. There is no trouble in making the correlation between the ruins from Doney Park to Turkey Tank: an increased rainfall would certainly make that region more livable but in the Elden region an increased rainfall would cause conditions just the opposite.

The present-day conditions at Gourd Flat and Turkey Tank are assumed from the climatic conditions found at the nearest station in the same plant formations. From the weather records that have been kept at Flagstaff in the Transition and Santa Fe in the upper part of the Upper Sonoran Zone we are able to make certain correlations. A correlation between rainfall and cloudiness for July and August reveals the fact that for every inch of rain there is an increase of twelve per cent. of cloudiness at Flagstaff and seven per cent. at Santa Fe. A correlation between mean temperature and cloudiness shows that with an increase of twenty per cent. of cloudiness there is but half a degree decrease in temperature. This is the same for both Santa Fe and Flagstaff. The change is so small as to have no significance. The mean temperature is then little affected by cloudiness or rainfall and seems largely determined by altitude.

The chief factors that determine the distribution of Indian corn have been discussed. At the present time the conditions at Flagstaff closely resemble those in regions of the humid East north of the line beyond which corn will not mature, as in central Maine. Without going into details we conclude that in the Elden Region with two inches more of rainfall in the growing season corn would not mature (too cold and cloudy) while with two inches less rainfall the conditions would be nearly as good as at the Hopi towns at the present time. On the other hand an increased rainfall at Turkey Tank would insure good crops, with less rain dry farming would be impossible. The conclusion that we would draw from this is that when the conditions were favorable for agriculture over a large area of the plateau during periods of increased rainfall, in the Elden region it would be too cold and cloudy. However, in the dry periods it would probably support a small population. In some early dry period the pueblo 60 was occupied and in a succeeding dry period perhaps pueblo 124 was occupied. Before either of these were built there seemed to have lived here a few of the ancient small house builders.

A number of the sites where potsherds are found are without any trace of ruins. Since on some of these the proportion of red and black decorated potsherds are about as abundant as the black and white it is probable that these sites were occupied by temporary shelters overlooking a patch of corn, the permanent home being a pueblo some ten or more miles away. We would infer from this that during the wet period when the pueblos in Doney Park, Gourd Flat and Walnut Canyon were occupied there were dryer years and at those times families moved up to the parks in the pine forest for the summer and tilled the arable land in the neighborhood of the springs.

As there is no historical evidence that any of the ruins were inhabited in 1541 when a detachment of Coronado's men passed just north of the district on the way to the Grand Canyon we must conclude that the region at that time was abandoned by pueblo people to the Apaches and the various tribes of Yuman stock which have since used it as a hunting ground.

Putting all we know together we can build up the following history. This history is largely speculation, but will form a working hypothesis for future investigations in this region (Fig. 2).

The basis for this is Huntington's curve of the big trees in California. During the general wet period between the beginning of our era and 650 A.D. our observations agree with those of Huntington that the high plateau might have been occupied by a people who lived in scattered farm houses. In the dryer portions of this period they congregated in the higher regions of the area and in damp periods lived in the lower portions. In times of stress, which do not seem to have been frequent, refuge was taken on easily defended hill tops upon which forts were constructed.

In the dry period that followed, 650–850, villages or loosely built pueblos were constructed in the higher portions near the springs. About Elden Spring the inhabitants in time of stress seem to have scattered up the side of Elden Mountain. Trails of potsherds were found which seemed to lead nowhere.

In the wet period, 850–1100, the same people that had previously constructed the small houses and later the loose villages now again broke up into small units. These units were not single one or two large-roomed houses, however, but were houses of from one to ten small rooms. These were scattered far out on the waterless regions. We found them in the Painted Desert in the lower part of Hopi Reservation and in the lower valley of the Little Colorado as well as along the Tuba City road, well past Dead Man's Flat.

Toward the end of this period the people seem to have come together and built pueblos perhaps first on the level country such as Pueblo 142, 124 and then on the hill tops 72 and 8 as protection from their enemies. Later between 1100 and 1300, the people built the so-called cliff dwellings in Walnut Canyon which appear to be the most recently occupied. These cliff dwellings are built under overhanging ledges of the canyon wall which would afford a certain amount of refuge and water could be procured even if it was necessary to descend several hundred feet to get it. As it was impossible in this site as well as on some of the pueblo sites to overlook the arable land temporary shelters were built near the corn fields.

In the growing desiccation of the years between 1000 and 1300 not only the people who occupied the cliff dwellings in Walnut Canyon but those who had constructed similar pueblos in other canyons to the southeast and southwest were scattered, some merging with a Yuman tribe to form the present Havasupai, who dwell in Cataract Canyon, and other migrated to the northeast and joined with the Hopi. There are traditions in both the Havasupai and the Hopi that they once occupied the pueblos of this region. There is no evidence that the Hopi, with their characteristic yellow pottery, ever had colonies in this region in the wet period that began in 1300. As this speculative history is founded on very little fact, future investigations may greatly modify it.

Conclusion.—Small house ruins are abundant in the region immediately east of Flagstaff, Ariz., for a distance of twenty miles, where they are associated with the ruins of forts, pueblos and cliff dwellings. A study of the environment of these ruins confirms the author's opinion that the pueblo Indian belongs to the Upper Sonoran Life Zone of which biota he is as much a member as the piñon or the sagebrush. His past distribution into the transition of yellow pine zone may be explained in two ways: (1) As a casual migrant. Just as an occasional cedar or piñon may be found under certain conditions of exposure growing in this same region, so the pueblo Indian may have temporarily invaded this zone. (2) His presence here may also be explained on the basis of the doctrine of the climatic cycles. These questions cannot be finally settled until much more work has been done in the pueblo region. Not only must the exact chronology of the different classes of small house ruins be determined, but also correlations must be made between one part of the pueblo region and another. As the small house culture is the only one that ever had a uniform distribution over the whole plateau, it is the one to which attention should be directed.

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ORIGIN OF CIVILIZATION THROUGH INTERMITTENCY OF CLIMATIC FACTORS.

J. Russell Smith.

The essence of Guizot's definition of civilization is that under it social order replaces individual independence. This definition is here accepted as being essentially correct. The term involves society or some form of activity of many individuals acting in some organized way to provide for the welfare of the individual and also for the welfare and maintenance of the society.

Judged on the basis of results to the society rather than mechanical device and physical control over nature it is to be questioned if the human species has any monopoly of civilization or even of leadership in the formation of societies among the animals of our globe. The definition that civilization is social order as contrasted to individual independence is one that will include species other than the human. The palæontological ancestors of man, like myriad other individuals of countless zoölogical species, were individualistic, predatory, even cannibalistic if their tastes happened to incline toward flesh eating.

How then has it happened that after many millions of years during which every animal's tooth was against his neighbor that there has been evolved among us something, at its essence very difficult of definition, which we call a civilization? It may have had many causes but there is much evidence to indicate that it happened chiefly as a result of intermittency of climate combining a season of no possible production with one permitting the creation of an abundant food supply. Civilization involves the possession of a surplus of goods, usually food, in the first instance. This relieves its owner from the necessity of laboring that he may live from hand to mouth and the labor may then be directed toward the construction of a dwelling or some other form of capital goods which in turn makes possible more individual labor. This possible labor may result in leisure and idleness or it may be actively directed toward either individual advancement or the advancement of the society.

But the laying up of stores of goods and the gathering of surplus are not apparently a functional part of animal life. Animals do not naturally accumulate. Instead, they seek, find, eat and pass on. The accumulation of stores is a habit, the work habit, which is an animal response to environment—the intermittent environment in which nature produces at one season and at another season produces not, so that the animal must hoard or adopt some other device to avoid the death from famine that follows the cessation of a food supply at the end of the productive season. The simplest of many devices to this end is storing. Through this storing of food arose the work habit, which is the mother of the surplus, which is the mother of civilization.

There is a part of the earth's surface where the dependability of tropic nature is so great that man and the other animals can rely on the unending continuity of heat, shower and sunshine, and the consequent vegetation, month in and month out, year in and year out—age long, and for epochs past it has been so. The myriad individuals of the animal world could eat and then rest, secure in the repetition of the supply without the necessity of much effort or any hoarding against the bad days of an unproductive season which came not.

To the north and to the south of this favored but lethargic belt stretched the zones of intermittent climate: first the savannahs and monsoon lands with a rainy season and a dry season which is economically a winter minus the thermal difficulties of low temperature. Then beyond that is the temperate zone where vegetation lies under the blighting frost with its prompt paralysis and subsequent torpor.

Plant life adapted itself to these handicaps by means of which Darwin and others have so well shown to us, and has advanced to the very verge of the glacier on the mountain top, and to the shores of the Arctic seas. The animals have followed to these same limits and in the adjustments to the intermittency of food supply there have been evolved numerous devices, some of which have, as a by-product, produced civilization and many of which have not. One of the simplest of all these responses is flight-migration as of birds, buffalo and the nomad.

The insects have shown the greatest adaptation. The most striking is an essential copy of the device of the plants—suspended animation; and they suspend it from season to season in all four of the stages of their life, namely, eggs, larvæ, pupa, and adult. In some cases the suspension of animation can continue for years pending the recurrence of proper living conditions. Many of the reptiles adopt the same cheap and easy device of torpor. Among the mammals we see another method of surviving the winter in the fattening and hibernation by which the bear and the woodchuck await the recurrence of spring food supplies. The hog, like many other animals, lays up a great treasure of fat in the prosperous days of autumn and like the camel from the oasis, lives on it in the hungry days that follow. All these devices are individualistic and none of them produces the work habit as does the storing up of food—the resort of man and many other animals notably the rodents, the ants and the bees.

While evidence is not abundant it appears that none of these devices are adopted by mammal, insect or reptile in the practically continuous climate of the torrid zone, and man in those regions is most notable for his lack of social progress.

It is certain that the bees and the ants with their hoards of food began to shield themselves from the hunger of the tropic dry season and the frost of the warm temperate zone, ages before man began to hoard food in the same climes. They are by ages our predecessors in the habit of having a surplus and they are also our predecessors in the possession of the work habit. They certainly exceed us in the uniformity of its possession and in the definiteness of their ideas toward it. It is also true that in some respects they have exceeded us in the development of a society. Their society is static, we must admit, but the race survives from generation to generation, something human civilizations of the western world have yet to demonstrate their ability to do—witness the decline of numbers in France and the Anglo-Saxons of New England, our dark ages and our renaissances. If a race is numerically dying out its civilization cannot claim to be even static.

The ants and the bees have in their social life recorded a great advance over humanity by making society the basis of a real evolution. In their evolution they have made physical recognition of their organization by evolving physical differences and rearing different types of individuals to perform different social services, as the queen bee, the worker, the drone or male. Their social rather than individual concept is ruthlessly shown in the slaughter of the male when he has functioned as a male. Humanity only begins this differentiation in school training and often does it all over again after school days are ended.

But leaving to others the comparisons between the society of man and the bees and the ants I hold that they are all the results of the intermittency of climatic environment to which the animal species have responded by the hoarding of food and the formation of the work habit.

Where this intermittency of climate, with this inevitable response, has not existed, there has been among men nothing that we are today willing to call a civilization. The late lamented Nathaniel Shaler, the greatest of American economic geographers, has pointed out the efficiency of winter and frost as agents for the creation of civilization. I wish to include in the same category a dry season which is essentially similar to frost in its effects on food supply, and which, with the frost, will explain the civilizations of Rome, Greece, Asia Minor, Carthage and North Africa, Egypt, Palestine, Mesopotamia, Persia, India, Ceylon, China and Japan. It should be noted also that the Incas of Peru lived and performed their wonders in an arid coast plain or the bracing and often frosty plateau like that on which the Aztics of Mexico lived, while equatorial Brazil, like equatorial Africa and the jungled East Indian Isles, has with its more continuous climate left man without the stimulus to work, to create a surplus and become civilized.

The intermittent climates may be divided into four classes with regard to the ease with which man may in them produce surplus sufficient for developing a civilization.

I. *The Tropic and Subtropic Rainy and Dry Climate.*—The best examples are India and Egypt. These are the cradles of the oldest civilizations because silt-laden rivers overflowed fertile plains, making easy the production for a non-productive dry season that had no devastating winter. Intermittency was here absolute but on its rigorous side, soft, sunshiny, warm, unexacting. On its production side it was most easy, attaining through irrigation the absolute maximum of dependability, making the most natural cradle for civilization.

II. *The Warm Temperature Winter and Dry Summer Climate.*—This is second in order of difficulty for man to master and second in point of time to have been mastered. The best examples are found in the Mediterranean type of climate where mild frosts of winter are in point of handicap assisted by a dry summer following a productive spring and greatly mitigated on its economic side by the possibility of irrigating where foreign water supply, as from mountains, flowed into the regions. This climate gave us the civilizations of Greece, Asia Minor, Rome, Carthage, Palestine, and probably Mesopotamia.

III. *The Cold Temperate Winter and Warm Summer Climate.*—As of north Europe, north China, northern North America. Man has only adjusted himself to this climate with its rigorous winter in the modern period. It is more difficult to live in than either of the other types. We could not do it until we had possessed ourselves of adequate methods of building and heating houses, a developed agriculture and good animal husbandry. Granted these bases in food supply the stimulus of this cold and violently changeable climate seems to produce the most efficient types of modern civilization. It is striking to note how close the important centers of all the great powers lie to the center line of this zone—New York, Chicago, London, Paris, Berlin, Dresden, Vienna, Petrograd, Moscow, Pekin and Tokyo all lie under a climate where a winter of snow and ice is replaced by a summer permitting abudant grain production.

IV. *The Subarctic Climate with Excessive Winter and Short Summer.*—This is the region beyond the grain line where, in the past, civilization has been almost impossible because of the difficulty of getting sufficient food in the short summer. Civilization is now likely to establish itself in this zone wherever there exist resources sufficient for the prosecution of one industry on a large scale, such, for example, as the gold mining on the Yukon, or the more enduring possibility of reindeer and fur farming. Man's "sustenance space" using Professor Penck's term, will be largely in other zones. The chief part of the food supply will come from southern regions through the means of the present highly organized international trade. Hence the great necessity of world organization to keep this trade alive.

BOOK REVIEWS.

Gordon, George Byron. *In the Alaskan Wilderness.* Pp. 247, illustrations, maps. Philadelphia, The John C. Winston Co., 1917. Price $3.50 net.

This modest volume by the director of the University of Pennsylvania Museum is one of those rare documents of the wilderness which the discriminating reader hails with joy in the grist of "travel and adventure books" that our prolific publishers annually put forth. It is the story of a thousand-mile canoe trip from the Yukon to the upper Koskokwim and down the latter to Bering Sea—a journey which the author and his brother were the first white men to accomplish, so far as records show.

But the book is much more than a mere tale of adventure. It is a graphic reflection of the inspiration and joy which primeval life can afford a cultured personality. It is also a most valuable and interesting account of the Indians of the lower Koskokwim as they were before contact with gold seekers had contaminated their primitive customs and handiwork; for the journey was made in 1907. In fact, its real purpose was to reconnoitre this scantily known section of Alaska in order to ascertain whether the number and character of the native population would justify a future anthropological expedition. Accordingly, geographical exploration, hunting, etc., were only incidental interests, although the topographical information gained was important, particularly with regard to Lake Minchumina, the portage from it into the north fork of the Kuskokwim and the course of the latter. A clear sketch may based upon the author's observations is included.

The enterprise was especially remarkable for the extreme simplicity of its organization and execution. There were only two in the party, the author and his brother. They employed no guides or assistants, but relied solely on their own efforts from first to last. Even the canoe was built with their own hands out of materials purchased in Fairbanks and in accordance with their own design (described in detail in an appendix). It gave perfect satisfaction and was the envy of professional prospectors encountered on the journey.

The trip proper occupied all of July and August and a month more was consumed in getting from the outlet of the Kuskokwim to Nome by steamer. A stormy, risky passage it proved, and some of the most thrilling pages of the book are those narrating it. The expedition was successful in every way and secured extensive collections of native manufactures.

Written in a simple, almost epic style, this very unusual book will touch a responsive chord in the heart of every one who has journeyed away from the beaten paths. To the experienced traveller it will commend itself by reason of the practical hints upon camping, outfitting, etc., which it contains.

Howard Palmer.

Lippincott, Horace M. *Early Philadelphia.* Pp. 340, illustrated. Philadelphia, J. B. Lippincott Co., 1917. $5.00 net.

In a city with the distinctive individuality of Philadelphia, with its peculiar traditions, its unique and fascinating history, its many ancient and quaint institutions, a book such as this is bound to find a large and interested group of readers. The author has not attempted to give us a formal connected history of the early days of the city. Rather he has brought together a large number of fragmentary and scattered accounts of customs, events and institutions that characterized the early growth of the city, and has told them with all the intimacy and charm that might be found in the exchange of stories by a group of old Philadelphians about a blazing fireside on a winter evening.

Many and diverse are the topics talked about. Naturally enough the book opens with an account of Penn and the early settlers and their city. Situated near the Delaware water front on the high land between Dock Creek (now Dock Street) and Pegg's Run (now Willow Street), the little settlement rapidly grew so that by 1698, 16 years after its founding, the city could boast of 2,000 stately houses "after the Mode of London." The author's account of Penn's "greene country towne" with its "many brave brick houses" surrounded by gardens and orchards, its streams and duck ponds and its beautiful Front Street, leaves the impression that in the settlement of this city the usual hardships and privations of frontier life were lacking. The thrifty Quakers came prepared, with all details arranged, and started their new life in contentment and peace. Although not founded until 1682, by the time of the Revolution the city was the greatest in the country.

How these prosperous people lived, how they met their new problems, formed new customs and institutions takes up the remainder of the book. The origin and development of such public institutions as the market stalls on High Street, afterward Market Street, the taverns, the theaters, the churches, the old schools, the University, are all given in interesting detail. The story of Franklin's "Leather-Apron Club" and how from it grew the first public library in America and the American Philosophical Society form two entertaining chapters, as also do the accounts of the formation of the Academy of Fine Arts and the Academy of Natural Sciences, both being the first institutions of their kind in North America. The growth of the city's unique sports is set forth in chapters on Fox Hunting and Cricket. How banking and insurance were begun in America is told in the chapters dealing with the Bank of North America, the Pennsylvania Company for Insurances on Lives and Granting Annuities, the Insurance Company of North America, the Philadelphia Saving Fund Society, and so on. Social institutions such as the Dancing Assembly, the Wistar Parties and the Philadelphia Club are likewise dealt with.

The various topics so far enumerated are sufficient to show the wide range of subjects treated. From beginning to end, the Philadelphian will find the book packed with what he wishes to know about the early city and the development of its institutions. The many illustrations (there are 120 of them) from photographs and prints are an invaluable supplement to the text and in themselves tell much of the absorbing story of the city's growth. In binding and press work also the book is most attractive.

Reade, Arthur. *Finland and the Finns.* Pp. 332, illustrated. New York, Dodd, Mead & Co. 1917. $2.00 net.

A description of one of the most interesting, if little known, sections of Europe by an Englishman who has lived many years in Finland as lecturer in the University of Helsingfors. The author deals with many aspects of Finnish life—its literature and music, its social customs, its economic life, education, political life, its relation to Russia, etc. The author writes with admiration of the Finnish character and accomplishments. While not distinctly geographical, several geographic relations are brought out. Perhaps the most interesting of these is connected with woman's suffrage. The motive that induced Finland to become the first nation in Europe to give equal suffrage rights to men and women is found, according to the author, in "the unusually large share taken by women in the life of the nation. This is due to the fact that Finland is a poor country." Both men and women must work. The women of the lower classes do their full share, especially on the farms, where they tend cattle, help in haymaking, take part in fishing, building and burning the forests. Among the middle-class women also a large number are engaged in commerce, while many are in professions. This equal sharing of labor has predisposed the Finns, when connected with other facts, to adopt the principle of sex equality in political as well as in economic life.

Stuck, Hudson. *Voyages on the Yukon and its Tributaries.* Pp. 397, illustrations, maps. New York, Charles Scribner's Sons. 1917. Price $4.50 net.

This volume, by the author of "Ten Thousand Miles With a Dog Sled," rounds out his portrayal of Alaskan life and scenery by presenting a description of the country under the more genial conditions of summer. From the head of the Yukon at White Horse, the reader descends its 2,500 miles of swirling waters to the sea, and then visits its chief tributaries—the immense system of waterways being utilized as the framework for a critical history and description of the territory. The author considers that human associations give scenery much of its keenest interest, and spares no pains in thus interpreting the scenery of the Yukon.

The work is really in the nature of a guide-book to the settled portions of the Yukon Basin, the meanings and derivations of almost all proper names being carefully set forth. The failure of placer mining as a basis for permanent settlement is instanced time and again, and one gathers that, even to-day, the future of the territory's largest towns is not assured beyond a doubt.

The book contains much material of geographical interest. Mention may be made of the author's observations that many of the great rivers of Alaska hug their right-hand banks more continuously than their left-hand banks, irrespective of the direction of their courses and even when flowing south, thus substantiating the rule deduced by Nordenskiold (and discussed more recently by Nansen) from the action of the great northerly-flowing rivers of Siberia, where the rotation of the earth was thought to be responsible for throwing the waters more forcibly against their right banks. The reader gains a graphic impression of the actions and habits of the mighty Yukon under varying conditions of season and terrain.

The book covers a broad range of topics, and offers many quaint comments upon human frailties. The style savors somewhat of the pulpit and the author himself calls it "an admittedly discursive book," but nevertheless it is an important contribution to the literature of Alaska and will undoubtedly be welcomed by a wide circle of readers.

HOWARD PALMER.

Veach, A. C. *Quito to Bogotá.* Pp. 335; maps; illustrations. New York, George N. Doran Co. 1917. $3.00 net.

Like an oasis in a desert is this book among the many travel books that are constantly coming from the press. A delightfully narrated story of a thousand-mile journey overland between the capital cities of Ecuador and Colombia, the book is much more than one of travel and adventure. It is a geographical book in the best sense of the term. The author's training as a physiographer has made his interpretation and descriptions of the physical features of the Andean lands he crossed exceedingly interesting and instructive but not technical. Of greatest value and interest is the constant interpretation of the economic, social and political life of the peoples in terms of their geographical environment. While the author is perhaps not specifiedly attempting to make his book such an interpretation, it is nevertheless packed with instances of these geographic relationships. The reader lays it down at the close with an unusual amount of satisfaction. He has enjoyed the incidents of travel through a primitive land, little known and sparsely settled, and at the same time he has gained a picture of the physical geography of the region that is vivid because it is described in terms that explain; he feels he knows and understands its climate because that climate is explained and its effects upon vegetation and upon man clearly set forth; he is able to form a picture of the life and occupations of the people and to appreciate the present conditions of their economic development. All this is done in a most informal manner by reproducing the author's journal of the trip written in route.

The author, a British engineer, and Lord Murray, representing British business interests in Ecuador and Colombia, set out on saddle-back from Quito in June, 1913. Crossing the high mountain peaks and ranges of northern Ecuador and southern Colombia they descended the Cauca Valley to Cali, making a side trip to Buenaventura on the Pacific coast. From Cali they further descended the Cauca by steamboat to Cartago, crossed the Central range of the Andes by the Quindio Pass, at an altitude of 11,500 feet, to Giradot on the Magdalena, and thence by rail reached Bogatá. They thus crossed a region little known to-day but of great historic interest and of possible future great economic importance. The author's vivid account of trip, land and people is greatly aided by many half-tone illustrations from photographs and by several maps. Two of these are relief maps of Ecuador and Colombia, one is a forest map showing the relation to rainfall, another is a political map showing the author's route. A series of geologic cross sections of the eastern Andes near Bogotá is added. Altogether this is one of those unusual books that can, we believe, be read with interest and profit by the general reader who is interested chiefly in travel and description, by the scientific geographer, and by the business man interested in the opportunities for commercial expansion in South America.

Kephart, Horace. *Camping and Woodcraft.* Vol. 1, Camping, pp. 394, illustrations. Vol. 2, Woodcraft, pp. 469, illustrations. New York, Outing Publishing Co. 1917. Price $1.50 per volume.

"From the autumn of 1903 to the winter of 1906 I lived, most of the time, alone in a little cabin on the Carolina side of the Great Smoky Mountains, surrounded by one of the finest primeval forests in the world. My few neighbors were born backwoodsmen. . . . Our manner of life was not essentially changed from that of the old colonial frontier." Under such circumstances Mr. Kephart wrote a series of articles for *Field and Stream* which later were amplified and gathered into a book that has been the prized possession of many an outdoor man. Now the book, under its original title, has grown into a brace of volumes.

Mr. Kephart's first little book, published in 1906, has had few equals and no superiors as a *vade mecum* for the man who wishes to live outdoors; but it had a defect which arose from the author's oversight, not his ignorance. It assumed that the person who desired to camp in comparatively settled country needed no instruction and advice. That defect has been remedied in the present edition, and to the treatment of every topic originally discussed by the author has been added the result of a decade more of experience.

The reader of "Camping and Woodcraft" may rest assured that the author knows his subject and has personally tried most of the devices recommended. The experienced camper as well as the novice will find abundant aids to easy living in the open spaces. The writer has intentionally avoided, however, the discussion of traveling in any form except the pedestrian one. Numerous illustrations make clearer the matters discussed.

These books, however, are not merely volumes for the library; they are so detailed and so valuable in their special line that their true place is out in camp and forest. There should be a pocket edition such as that of 1906, with reduced size of page and with four volumes instead of two if India paper is not procurable. In that case this classic of the outdoors will be one of the best comrades a camper can possibly find.

WALTER LEFFERTS.

Haworth, Paul Leland. *On the Head Waters of Peace River.* Pp. 295, illustrations, maps. New York, Charles Scribner's Sons. 1917. Price $4.00 net.

An enthusiastic narrative of hunting, fishing and canoeing in the "Peace River country" of the Canadian northwest is presented in this volume. The author, with one companion, starting from the Fraser, crossed the long-traveled Griscome Portage to the Parsnip River and then worked his way into the region about the headwaters of the Finlay. Here the canoe was left and they "back-packed" into the western foothills of the Rockies. whence "forty or fifty miles" away they caught sight of a glacier—"an immense affair covering many square miles of territory," which the author predicts "will be found to be one of the biggest, if not the very biggest, in the whole Rocky Mountain system." Returning, the party descended the Peace River to railhead at Peace River Landing.

The book is written in a breezy, anecdotal style, with considerable elaboration of detail. It displays close observation, abounds in local color and will make a strong appeal to students of wild animal life in the Canadian west. The volume is well gotten up, with illustrations from photographs and two clear maps, but lacks an index.

Howard Palmer.

Mawson, C. O. S. *Geographical Manual and Atlas.* Pp. 385. Garden City, Doubleday, Page & Co. 1917. $5.00 net.

One of the many results of the War has been the increased interest in maps. Heretofore, the average American has little appreciated the value of maps, partly because he has never been educated in the use of atlases, partly because there has been no really good and inexpensive American atlas. It is to be regretted that such an elaborate undertaking as represented by the work under review should fall so far short of meeting the need for a really first-class atlas. Compared with most other American productions of its class it possesses some praiseworthy features, but when judged by European standards for atlases selling at the same, or much less cost, it is sadly lacking.

The map portion of the atlas contains 240 pages. A series of maps in seven shades of color show the physical features of all the battle fronts in Europe and Asia Minor. Likewise for each continent there is a physical map in colors, temperature and rainfall maps, vegetation maps, densities of population and economic resources, races, etc. The attempt to show these facts is most highly to be commended, but the execution is so mediocre and the mistakes so glaring that the atlas loses much of its value. To mention a few of the errors a casual examination of the maps discloses will be sufficient. On the physical map of Europe (p. 20), the Vosges Mts. are put in Luxemburg, north of the Moselle River, 150 miles out of their true location; on the map of Asia, a railroad is shown to extend from Canton to Hankau (p. 57) where none exists, while the railroad from Bankok to the Straits Settlements is not indicated at all; in the population map of Asia (p. 62) the legend states towns of 100,000 are shown in blue dots, but many omissions occur, as for example, Hong Kong, while most of the dots are unnamed; English-speaking Jamaica is shown to be Spanish in language (p. 120). Economic maps are usually unsatisfactory at best, but here they are very incomplete, highly generalized and often inaccurate. On the economic map of S. America (p. 125) the great iron-ore deposits of Brazil and Chile are not shown; several rivers are indicated as navigable from the sea which are not navigable, as the San Francisco and the Tocantins, while the Uruguay is wrongly shown to be unnavigable.

One hundred pages are devoted to state maps of the United States, on which are shown in heavy red lines the principal automobile routes. Over 100 pages of text are descriptive of lands and peoples. This consists largely of quotations from various authors strung together into a running discourse on each country, and supplemented with statistical synopses of animal, vegetable and mineral products. Even twenty-one-day trips to Europe are outlined for the tourist. Encyclopedic is the scope of the textical matter. The index of towns for the United States is complete, covering 37 pages; for the rest of the world the index consists of less than 5 pages. The maps showing political features and locations are many and good. The introduction into a popular atlas of physical maps and climatic maps is a step in the right direction. The book is of convenient size and attractively bound.

ACTIVITIES OF THE SOCIETY.

ROUND ABOUT MOUNT RAINIER.

BY HERBERT W. GLEASON.

Herbert W. Gleason, vice-president of the Appalachian Mountain Club of Boston, was the speaker on the evening of Wednesday, January 2. Mr. Gleason has long been an enthusiastic traveler and naturalist, and the quality of his illustrations for the works of Thoreau, John Burroughs, Muir and others had led the audience to expect an equally high standard of illustration for the discourse on the theme "Round About Rainier." Mr. Gleason more than fulfilled this expectation, and matched a rare felicity in diction with artistic depiction.

HEILPRIN MEMORIAL LECTURE, "THE BAGDAD RAILWAY IN THE WAR."

BY H. CHARLES WOODS, F.R.G.S.

H. Charles Woods delivered an illustrated address on the evening of Friday, January 18, taking for his subject "The Bagdad Railway in the War." Mr. Woods pointed out the strategic significance of the capture of the famous city of the Caliphs, and the effectual obstacle it interposed to Germany's ambitious dream of a military half-way house to India and Egypt, in Asia Minor.

THE NEW RUSSIA.

BY SIR JOHN FOSTER FRASER.

The lecture by Sir John Foster Fraser on Wednesday evening, February 6, made a profound impression on all who heard it. The subject was "The New Russia." With remarkable eloquence, scintillating wit and keen powers of analysis the speaker described the chief actors in the political drama, and described the Revolution as owing its inspiration chiefly to the Jews. His characterization of the Romanoffs made clear their unfitness for their responsibility, and the inevitableness of their downfall.

FLYING ON FOUR FRONTS.

BY LIEUTENANT BERT HALL.

Vivid descriptions of his war experience as an aviator were offered by Lieutenant Bert Hall on Saturday evening, February 23. Lieutenant Hall was in the battle of the Marne and at Verdun. He has served on the French, British, Russian and Roumanian fronts.

THE ROCKY MOUNTAIN AND MESA VERDE NATIONAL PARKS.

BY FRED PAYNE CLATWORTHY.

Beautiful illustrations in natural colors by Lumière autochromes accompanied Fred Payne Clatworthy's vivid description of two of the greatest of our national parks, on the evening of Wednesday, March 6. In the intensive cultivation of an interest in American scenery Mr. Clatworthy is performing a valuable missionary service.

THE INTERNATIONAL NORTHWEST.

BY FRANK BRANCH RILEY.

Another superbly illustrated lecture was that of Frank Branch Riley, on "The International Northwest," on Wednesday evening, March 20. Mr. Riley, who is a resident of Portland, Oregon, is thoroughly at home in the region he discussed, and is a singularly entertaining speaker.

A recent communication from the Secretary of the Royal Geographical Society, extends, on behalf of that Society, the hospitality of their House and an invitation to attend meetings to all members of our Society sojourning in London. Members in a position to do so, will doubtless be glad to avail themselves of these courtesies so generously extended.

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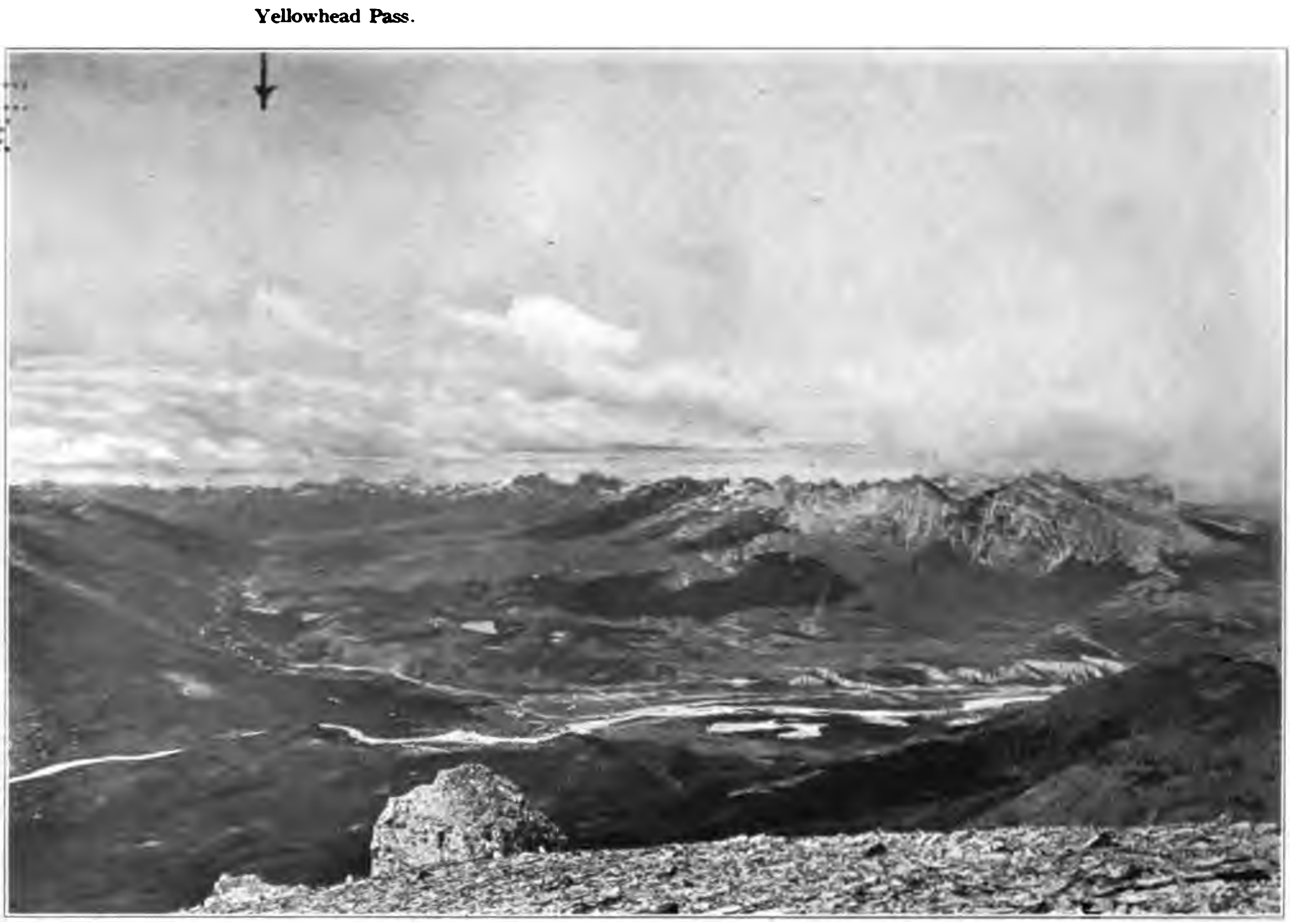

Looking west across the Valley of the Athabaska towards Yellowhead Pass. (Photograph by the Dominion Topographical Survey.)

EARLY EXPLORATIONS IN BRITISH COLUMBIA FOR THE CANADIAN PACIFIC RAILWAY.

HOWARD PALMER.

The first definite step towards the creation of the Canadian Pacific Railway as it exists today may be said to have been taken in 1869. In that year the Colonial Secretary of the Dominion of Canada addressed a dispatch to the Governor of British Columbia on the matter of uniting the latter with the rest of British North America. An essential condition of the union obviously would be the development of some easy and certain means of communication across the continent, so it is not surprising that when on July 1, 1871, British Columbia finally entered the Dominion, the immediate construction of a railway was provided for. It was expressly stipulated that within two years the Dominion of Canada should commence work on a line to connect the seaboard of British Columbia with the existing railway system of Canada and that it should complete the same within ten years. Thus were crystallized the vague dreams of a generation of explorers—dreams such as had inspired Alexander Mackenzie, John MacLeod, David Thompson and many others in their arduous journeys to find an overland route that would facilitate intercourse with China and the East.

The decision to build a railway having been made, there at once arose the question of its proper location in the immense wilderness of the Northwest Territory. Little was known about the region save its general character and most of it had never been surveyed. It is true that the Hudson's Bay Company had long maintained fortified posts within it for carrying on the fur trade, and regular communication had been kept up between them over well-established trails and lines of water travel; then too, there were available a number of published descriptions of the country from the pens of capable travelers. Nevertheless, in such a vast undertaking, information of this character could not be expected to do more than define the field for preliminary investigations and many people in

Canada condemned the scheme as visionary and productive of certain disaster.

Commencement of Surveying Operations.—On the very day of the union, July 1, 1871, surveying operations commenced under the direction of the late Sir Sandford Fleming as engineer-in-chief. Twenty-one parties, numbering 800 men, were organized and distributed in divisions all the way from Ottawa to the Pacific.

In British Columbia, three parties had the work in charge. One, Party Q, under Mr. Roderick McLennan, starting from Kamloops, was to survey a route via the North Thomson River, Albreda Pass and Cranberry Lake to Tete Jaune Cache and the Yellowhead Pass; while two others, designated as Party S and Party T, under Mr. Walter Moberly, were to select a suitable line between Kamloops and Howse Pass. Especially strong and well-organized were the Moberly parties, for Howse Pass appeared to afford the most promising route across the Rocky Mountains and it was of prime importance to select a pass through them at the earliest moment, owing to its control of so much of the railway on both sides of the chain.

Moberly had already, in 1865, discovered Eagle Pass in the Gold range and Party T, now starting from Kamloops under Mr. Edward Mohoun, was charged with the task of running an instrumental survey through it to the Big Eddy on the Columbia River near where Revelstoke stands today. The other, Party S, under Mr. D. C. Gillette, travelling easterly from Hope, on the Fraser River, to Wild Horse Creek, was to proceed thence northerly through the Columbia-Kootenay valley to the mouth of Blaeberry River, which is the westerly exit from Howse Pass. Here a base camp was established and operations began.

By the end of November, 1871, the party had completed the profile of a trial line from the Columbia up the Blaeberry to the summit of Howse Pass. Unfortunately, a heavy snowstorm overtook the party on the pass and prevented it from making a trial location survey down through the critical portion of the way—the steep descent of the first three or four miles. However, it was ascertained beyond a doubt that a line could be obtained, so Moberly prepared to return to civilization in order to make a report to the engineer-in-chief.

As no apprehensions had been entertained about the practicability of bringing the railway up to Howse Pass from the plains on the east by way of the North Saskatchewan River, Moberly realized that except for the obstruction offered by the Selkirk Mountains, one good route, at least, for the railway, was a certainty. It is typical of his dauntless and energetic character that, even in the teeth of rigorous winter conditions, he should seek an immediate solution of this final riddle by returning directly through this unexplored range. Since the trip appears to be the first recorded passage of the Selkirks, the following extracts from Mr. Moberly's writings are presented:[1]

First Crossing of the Selkirks.—" Accompanied by [six of] my ever-faithful Indians [as packers] and the late Honorable Mr. Todd, I started for a long snow-shoe walk to New Westminster [It took them 54 days] and proceeded down the Columbia River [on the ice] to the latitude of Gold [or Bushay] River in order to see if I could get a line through the Selkirks by a high pass between the headwaters of Gold River and those of Gold Creek [the Gold Stream of today] or if it would be possible to connect those valleys by a tunnel. If I could get a line this way, it would very materially shorten the distance between Revelstoke and Howse Pass.

" After a very fatiguing journey through the Selkirk Mountains by this high pass in which we were very nearly buried beneath an immense avalanche that came roaring down the steep mountainside when we were near the summit, we reached the almost deserted mining town on French Creek that I had before visited in the year 1866 when I constructed a trail between it and the Seymour Arm of Lake Shuswap.

" I here met several old acquaintances and the following afternoon went on to McCullock's Creek which was entirely deserted and the remains of the few buildings still standing were in a very dilapidated condition. Two more days' travel against a strong head wind, which was excessively cold, brought us to Mr. Mohoun's winter quarters at the Big Eddy just before Christmas Day.

" I spent a few days with Mr. Mohoun's party waiting for the plan and profile of the line surveyed through the Eagle Pass which I found showed that a very good location could be obtained, and then having arranged with Mr. Mohoun to push forward the survey through the Selkirk Range by the valley of the Illecillewaet River and the pass by its southeasterly fork, which was discovered, as before mentioned, by my assistant, Mr. Albert Perry in 1866 and was subsequently very improperly named Rogers Pass, I resumed my way westerly through the Eagle Pass to the Great Shuswap Lake."

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[1] From a recent address by Walter Moberly before the Art, Historical, and Scientific Association of Vancouver, B. C., entitled " The Early History of the Canadian Pacific Railway," and published in its reports. The brackets are inserted by the present writer from information obtained elsewhere.

The Adoption of Yellowhead Pass.—The examination of the other route (Kamloops to Yellowhead Pass) was also completed in 1871 so that the first season's work enabled the engineer-in-chief to compare the gradients, distances and relative merits generally of the two proposed lines through British Columbia.

On April 2, 1872, the government, by an order-in-council, adopted Yellowhead Pass. Favorable grades in the approaches and elsewhere were the leading reasons assigned by the engineer-in-chief. The mileage was not greater than via Howse Pass and a cheaper and a better line could be obtained. The Yellowhead Pass would be available no matter what harbor was eventually selected on the Pacific coast, whereas the Howse Pass would serve only if Bute or Burrard Inlets were chosen. Further, Moberly's failure to find a good pass across the Selkirks inured to the advantage of the Yellowhead, for a direct line across the Selkirks would have made the Howse route decidedly shorter than its rival.[2] As a result of this de-

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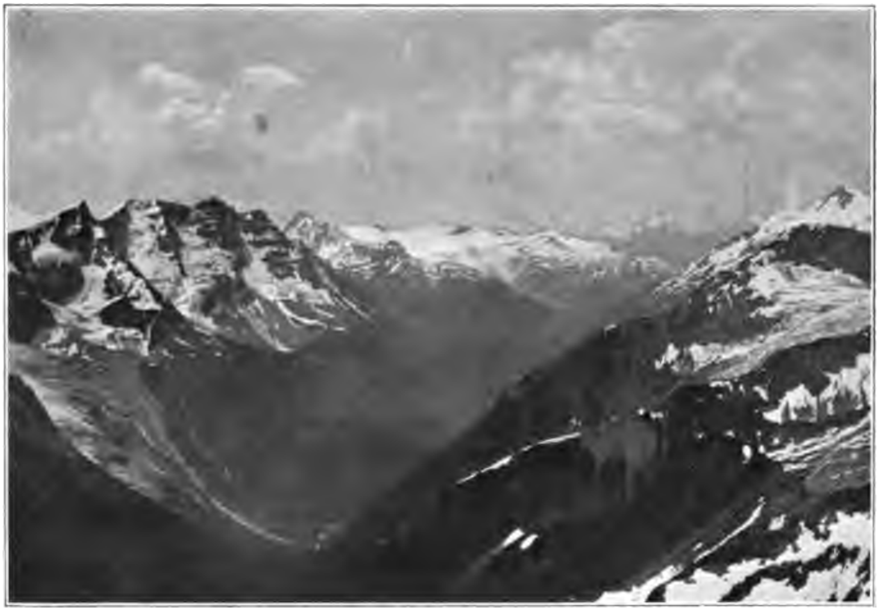
[2] By way of comparison, the distances between Winnipeg and Kamloops via the different routes discussed in the paper are given below:

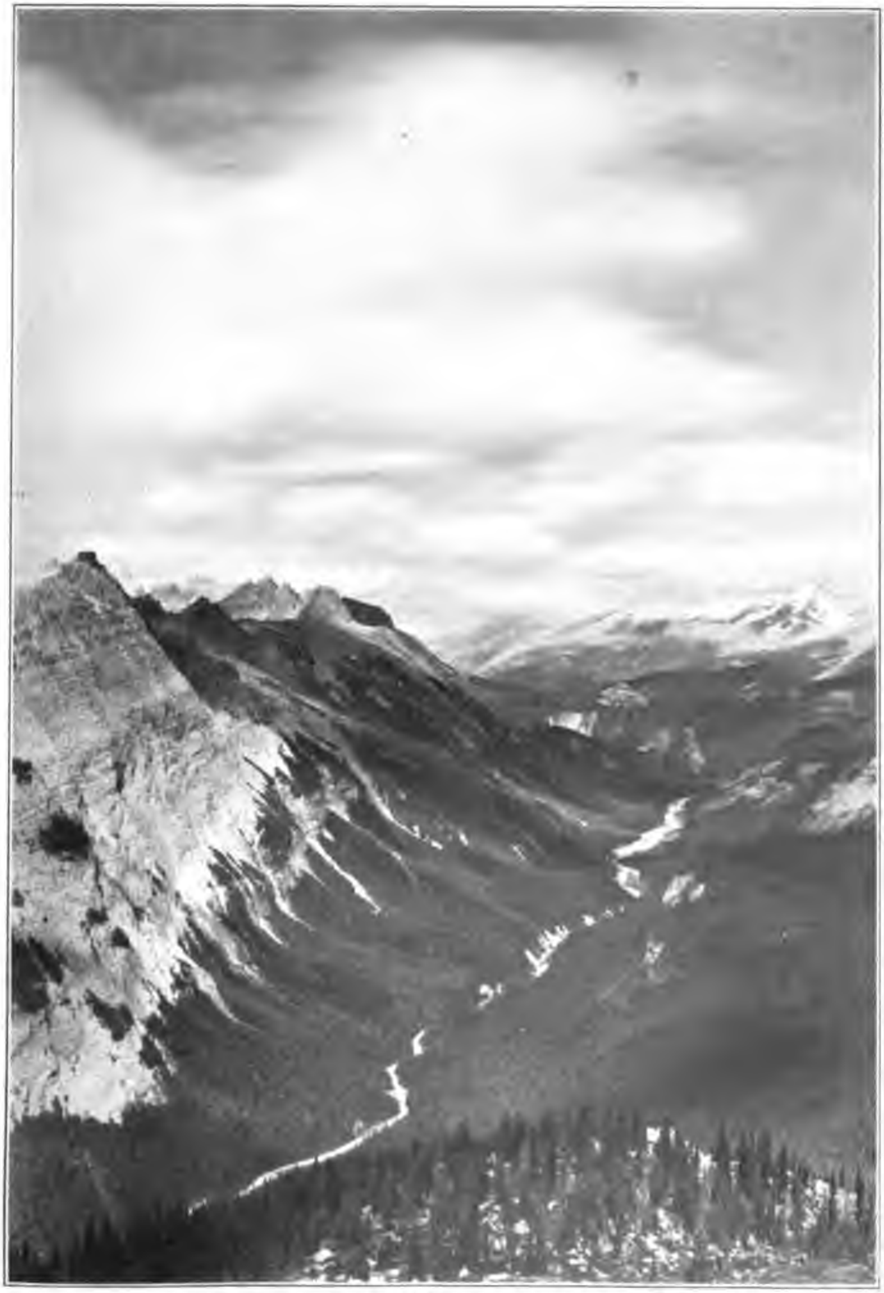
	Miles.
1. Via Edmonton, Howse Pass, Big Bend and Revelstoke (a close approximation)	1377
2. Via Edmonton, Yellowhead Pass and Albreda Pass (Canadian Northern R. R. mileage)	1346
3. Via Edmonton, Howse Pass, Rogers Pass and Revelstoke (Canadian Pacific R. R. mileage from Donald)	1290
4. Via Calgary, Kicking Horse Pass, Rogers Pass and Revelstoke (Canadian Pacific R. R. mileage)	1224

The distance by way of the Columbia River around the Big Bend is about 150 miles in round numbers. Between the same points directly across the Selkirks via Rogers Pass it is 63 miles. Consequently the latter way saves about 87 miles and it will be noticed that Route (3) would have stood an excellent chance of being chosen, had the Selkirk pass been known when the choice of Route (2) was made in the spring of 1872. Route (4), excepting Rogers Pass, was also well known at that time (as a result of the Palliser Expedition of the Fifties) but for some reason, not at all clear, was ignored.



Moberly Pass across the Selkirk Mountains.
Photograph by Howard Palmer.

A Typical View of the Selkirk Mountains.
Photograph by Howard Palmer.



Upper Blaeberry Valley, looking towards Howse Pass. (Photograph by the Dominion Topographical Survey.)

cision all surveying operations at the Howse and Eagle Passes were discontinued and orders given to transfer the parties elsewhere.

To one conversant with the history of the railway project during the next decade, the situation produced by this decision affords most interesting food for thought. Throughout all the time between 1872 and 1880 exploratory activities were devoted to the Yellowhead region and related routes, yet fifteen years after the decision was made the railway was actually operating across the Selkirks and through the Eagle Pass over much of the very line thus abandoned after the first year's surveys! All the work done in the meantime at an expense of some $3,100,000 was therefore thrown away. Howse Pass, it is true, was not utilized, but the Kicking Horse Pass which actually takes the line over the continental divide is a near neighbor and was a foregone conclusion when it was decided to enter the mountains by way of the Bow Valley from the latitude of Calgary instead of by the North Saskatchewan from the latitude of Edmonton.[3]

In the light of these extraordinary facts certain queries quite naturally suggest themselves. If Moberly had found a good pass on his winter journey of 1871 across the Selkirks, would not Howse Pass have been preferred to the Yellowhead? And if so, would not the road have been built at once? And again, if the Yellowhead was so manifestly superior, why was construction not begun on the route that the engineer-in-chief described as satisfactory in 1872, namely, that via Albreda Pass and the North Thompson River (now occupied by the Canadian Northern Railway), instead of carrying on ten years of additional explorations and surveys on the mere chance that it might be bettered?

Very likely it is idle to indulge one's fancy over these matters so many years after the chief actors have departed, but on the face of it, it is hard to avoid the conclusion that the southern route was dismissed prematurely in 1872. The lack of passes in the Selkirks was too easily taken for granted and upon this the whole decision appears really to have hinged. One unsuccessful attempt to secure a good pass by no means demonstrated the impassability of the range as a whole. Moberly in 1871 knew of the present Rogers Pass, and although he may have doubted its utility (as seems likely from the fact that he chose to try another way in making his winter journey to Victoria) he did, nevertheless, expect to examine it in 1872. Even though the pass should turn out to be useless, only a short-sighted policy could have permitted it to be ignored, with the necessary men and supplies almost on the spot.

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[3] Possibly the earliest suggestion of the route across the mountains now followed by the Canadian Pacific Railway is that made by a map "To illustrate a Paper on the means of communication with the Pacific Ocean by Capt. M. H. Synge, R. E.," drawn by John Arrowsmith and published for the Royal Geographical Society by John Murray, 1852. The route follows the Bow River, which is named, and goes around the Big Bend of the Columbia, crossing the Gold Range north of Shuswap Lake and following down the Fraser. For the map, see Proceedings R. G. S., Vol. 22, p. 174, 1852.

Before leaving the subject, it should be added that still other reasons may have been influential in the selection of the Yellowhead Pass besides those above discussed, although they are taken from official reports or government documents. Mr. Henry J. Cambie who was associated with the railway in construction days has suggested that the line to the Yellowhead from Winnipeg ran all the way through what was then known as the " fertile belt," the country to the south on the approach to Howse Pass being considered barren or nearly so; furthermore, that it was more remote from the American boundary than the other passes and, consequently, there would be less difficulty in borrowing money for its construction as a military road.

Be this as it may, exploring activity for the next decade centered upon the Yellowhead district, and it is to this that we may now advert. From the pass itself, two courses only were open for the road: one in a northwesterly direction by the valley of the Fraser, the other due south by the Albreda and Thompson Rivers. By either of these, the lofty and defiant Cariboo Mountains, which barred a direct westerly course, as the Selkirks did at the Howse Pass, might be flanked and the great interior plateau reached. From this central plateau, eleven different routes diverged through depressions in the formidable Cascade range to seven distinct harbors on the Pacific coast. When it is stated that all of these were more or less carefully surveyed, not to mention certain variant lines, some idea of the magnitude of the operations may be obtained.

Space will not permit reference to this immense network of routes, nor to the arduous labors and perils undergone by the surveyors. Some day, no doubt, the stories will be rescued from the oblivion of the government reports and well worth the telling they will be. Here it is merely proposed to call attention to some little known journeys by Walter Moberly and others in the region of the Columbia and Fraser watersheds, which present points of especial geographical interest.

Trip over Athabaska Pass.—In accordance with his instructions, Moberly began in the spring of 1872 to transfer Party S from the outlet of Blaeberry River, where it had occupied winter quarters, to the Yellowhead Pass by way of the Columbia valley and the Athabaska Pass. It was indeed a formidable undertaking. The entire one hundred and fifty miles of the route lay through an untravelled country obstructed by thick forests of immense trees, tangled undergrowth, fallen timber, canyons and dangerous rapids, unnavigable for boats even going down stream.

For a small light party the trip would not have been out of the ordinary. It was the large outfit of pack animals and great quantity of supplies that gave the enterprise its serious character. For the passage of the pack animals, a trail had to be constructed the entire distance, first along the Columbia to Wood River and then along the latter to Athabaska Pass. As it turned out, they found that boats could only be employed as far as the foot of Kinbasket Lake, some sixty miles from the starting point, so that the pack-horses freighted the supplies over the remaining distance. To reach the foot of this lake consumed over ten weeks (June 16 to August 27).[4]

In order to prospect personally the ensuing portion of the route as well as to meet the engineer-in-chief, who was making a transcontinental tour of inspection, Moberly decided to leave the party and to set out across country directly for the Yellowhead Pass. Taking three Indians and very light packs, he started on August 27 from the foot of Kinbasket Lake, striking straight up the mountain-side in the direction of Athabaska Pass in order to reach the valley of Wood River without going around by way of the Boat Encampment.

"The steep ascent of this mountain-side from Kinbasket Lake was extremely toilsome, and we suffered dreadfully for want of water. The exposed, scantily timbered, rocky face of the mountain, with the sun beating down on us and making the rocks hot, combined with myriads of black flies, rendered this climb trying in the extreme.

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[4] Canadian Pacific Railway: Report of Progress on Explorations and Surveys, Ottawa, 1874, Appendix G by Walter Moberly, C.E., pages 164 and 165.

"When we got high up the mountain, and just before entering a very elevated pass, we had a magnificent view over the northerly portion of the Selkirk range, and also of the easterly side of the Gold, and the westerly side of the Rocky Mountains, and as the sun was shining brightly, the sky blue and the atmosphere clear, the innumerable peaks covered with snow and glaciers, glittering in places, together with the deep green forests clothing the lower portions of the mountain ranges, and the Columbia River, like a silver ribbon, wending its way through the deep, narrow gorge far below us, impressed me with what stupendous grandeur primeval nature is endowed.

"We camped on the bank of a lovely stream in a park-like valley through the mountain spur, at an elevation above the sea of probably six thousand feet. The following morning we pursued our way for some distance through this valley, and then reached the northerly steep declivity of the mountain, down which we went, following the dry bed of a water-course.

"On reaching the bottom of the valley of Wood River we had to wade for some distance through stagnant water containing some reddish-brown substance—probably decomposed iron ore—of a disagreeable nature, so that when we got to Wood River itself we plunged in to free ourselves of the nauseous substance which painted us. We continued along the south bank of the river for some distance and then constructed a raft and crossed to the north bank, which we followed until we reached the foot of Mount Brown and found the trail of the old fur traders going up the steep mountain. Here we camped and cooked a porcupine."[5]

Moberly reports the angle of ascent to Athabaska Pass to be upwards of 75° at one place. They rested on the pass for a few days to make new moccasins out of caribou hides and to smoke the meat for the remainder of their journey.

Discovery of the Source of the Fraser River.—Upon resuming their way, instead of descending the Whirlpool River by the usual route, they traversed along the easterly side of Mt. Brown towards the north, and then by means of a gap (elevation 6,500 feet) crossed a range of mountains forming "the northerly boundary of a pass, immediately north of Mt. Brown, connecting the valleys of the Whirlpool and (probably) Canoe Rivers." They found themselves near some small ponds at the head of "a beautiful valley surrounded with grand and magnificent scenery." These ponds later proved to be the true source of the Fraser River. The torrent flows about N. 50° W. (mag.) for some thirty miles and joins the smaller stream from Yellowhead Lake a short distance below it. Moberly describes the upper twenty miles of its course as "a fine valley with grassy slopes and picturesque groves of fir trees," fairly easy to travel through. Lower down, however, it narrows and the river is confined in canyons and gorges.[6]

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[5] Quoted from Moberly's address before the Art, Historical and Scientific Association of Vancouver, already cited. The extract is slightly condensed.

As far as the writer is aware, Moberly's report presents the first description of the source of the Fraser River.[7] Apparently it has been entirely lost sight of at the present time for a large sign at the outlet of Moose Lake informs the passing traveller on the Grand Trunk Pacific Railway that the source of the Fraser is at that point.

The remainder of Moberly's movements can be summarized briefly. He arrived at Yellowhead Lake on September 6, nine and one half days from Kinbasket Lake—a truly remarkable tour-de-force, when it is considered that the air-line distance is not less than 75 miles. After remaining in the vicinity of Yellowhead Pass for a fortnight, he set out upon his return journey from Henry House, taking horses and adopting the route via the Athabaska and Whirlpool valleys. It took four days' travelling to reach the "Committee's Punch Bowl," the historic tarn on Athabaska Pass, where the snow lay four inches deep. He was much concerned to encounter swampy ground for fifteen miles along the north side of the pass, for two hundred and fifty horses and all the supplies which were in process of being transported from the Columbia valley would have to pass over it on the way to winter quarters at Henry House.

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[6] Report of Progress, 1874, already cited, Appendix G, p. 166.

[7] Moberly's account is substantiated by James McEvoy, of the Geological Survey of Canada, who climbed Yellowhead Mountain in 1898 and reported "a good view is obtained up the Fraser River and it is seen to take its rise, as its muddy waters indicate, in glaciers on high mountains some twenty miles to the south." Annual Reports Geological Survey of Canada, Vol. XI, Part D (1900).

Moberly writes: "I went on and early in the morning of the third day from the Committee's Punch Bowl, having waded almost endless fords and dragged and jumped the horses through and over thick woods, underbrush, rocks and fallen timber, reached the camp of Party S which was on the south bank of Wood or Portage River about two miles above the Boat Encampment, it having been exactly a month since I left the party at Kinbasket Lake. I told the party it was my determination to push forward with the supplies and animals across the Rocky Mountains to the Athabaska River, where I had instructed Mr. McCord to build a depot, and also to finish the survey through that range to its easterly base before closing work for the season; I gave those afraid of undertaking the trip the opportunity of leaving, which only a few availed themselves of, and the rest of the party went to work with a most praiseworthy will, working both week days and Sundays, through rain, snow and cold, without knocking off for an hour until the trail was opened and the survey party reached the Athabaska depot."[8]

Moberly passed the winter of 1872–3 at his depot near Henry House east of the Yellowhead Pass. The early part of 1873 he was engaged in surveys easterly towards Edmonton. On July 30 he received orders to return with his party through the Yellowhead Pass, to make surveys westerly towards Albreda Pass and then to explore the headwaters of the North Thompson and Canoe Rivers for a good route across the divide of the Cariboo Mountains towards the Clearwater and Quesnelle basins.

He writes: "Taking my three Indians with me, I proceeded to explore the country at the headquarters of the Canoe River, and very soon found there was no pass in that direction. I then (October 14) went to the forks of the Albreda and North Thompson Rivers, and up the valley of the latter (twenty-three miles). I found the country densely timbered and difficult to travel through until we reached a high elevation. I pursued my way until, at a very high elevation, I was surrounded by high snow-capped peaks and glaciers that presented an impenetrable wall of rock, snow and ice."[9]

On October 21 near a pass leading to the Clearwater basin he encountered a heavy snow-storm which put an end to further work. He retraced his steps as he had come and then descended the Thompson River to Kamloops by raft. This terminated Moberly's mountain investigations in British Columbia.[10]

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[8] Quoted from Appendix G, already cited, p. 167.

[9] Quoted from Moberly's address before the Art, Historical, and Scientific Association of Vancouver, already cited. See also Report of Progress, 1874, Appendix H by Marcus Smith, C.E., p. 186.

Explorations in the Cariboo Mountains.—Even a cursory account of the explorations of the Seventies should not omit reference to the efforts made to pierce the fastnesses of this forbidding snow-clad range which has succeeded better perhaps than any other one of the inland mountain systems of British Columbia in repelling human intrusion. Today it is commonly held to be entirely unexplored, but in the report[11] of the engineer-in-chief for 1877, we find that:

"Many fruitless attempts have been made to carry the railway line through the colossal wall of mountains which presents so imposing a barrier to its westerly course for so many miles north and south of Tete Jaune Cache. *So far as known every depression has been examined and every indentation explored without success.* The few lateral valleys which at wide intervals exist immediately terminate in gorges, again to disappear in glacial sources at high altitudes."

In view of the prominence that the Cariboos will soon attain by reason of the recent completion of the Canadian Northern and Grand Trunk Pacific Railroads, from both of which they are in full view, the following notes concerning the early investigations may be found of interest.

Perhaps the most ambitious expedition was that under Mr. James A. Mahood (Party R), which left Barkerville on the twenty-third of August, 1871, twenty-two men and some fifty horses strong. They were to seek a passage directly east to Tete Jaune Cache. The route pursued was: Barkerville to Bear Lake, thence to Indian Point Lake, thence around the north and east sides of Isaac Lake to its outlet, thence up Swamp River to and through "Dominion Pass." This conducted them over the crest of the range to the headwaters of Castle River which is tributary to the Fraser near McBride station on the Grand Trunk Pacific. As this region is blank on the latest provincial map, the route cannot be more definitely described.

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[10] Although the name of Walter Moberly is not a familiar one on the roll of explorers of western Canada, it does, as a matter of fact, deserve a leading place there. In addition to the achievements mentioned in this paper, he played a prominent part in promoting the famous Cariboo Road, later being associated with its construction, was a member of the Provincial Legislature and for a time was Surveyor-General of British Columbia. He founded the city of New Westminster, and, after Captain Vancouver, was one of the first white men to land on the site of the present city of Vancouver. In his many years of travel and exploration devoted to developing routes of communication, he covered substantially all of the rugged, difficult country of southern British Columbia, and his detailed knowledge of its geography thus acquired was probably unsurpassed. Moberly was born in 1832 in Oxfordshire, England, and died in Vancouver in 1915.

[11] Canadian Pacific Railway: Report of Progress, etc., by Sandford Fleming, Engineer-in-Chief, Ottawa, 1877, p. 31.

Dominion Pass.—The account of the crossing of the pass reads as follows:[12] "Pushing along, despite the innumerable difficulties that beset the way, the party reached the hoped-for pass, which high and glacier capped, towered up in front of them, as if to crush out hope and defy further progress. For the animals, a passage over it had to be cut out with picks and axes, and on the twenty-ninth of September, the party emerged from Dominion Pass. At this point the packers became afraid of being cut off by snows and threatened to desert the stores and return to Cariboo. Fortunately they were persuaded to remain, otherwise the effort to reach the valley of the Fraser must have been abandoned."

Between the fifth and tenth of October, continuous snow-storms were encountered in the upper Castle River valley, but the Fraser was gained November 20 and the party encamped for the winter. On the fourth of December, Mahood started back (apparently by the same route) for Barkerville, which he reached twelve days later, after covering one hundred miles.

Owing to the gradients and the summit glacier, this pass was out of the question for a railway. The country traversed was found to be very rough with scanty feed, so that a large number of the animals perished. During the winter the party searched both northerly and southerly from their camp for some opening through the Cariboo range that would lead back westerly towards the Cariboo country whence they had originally come, but in vain. Eventually they moved up the valley, joining Party Q at Cranberry Lake, and in the spring of 1872 went down the Thompson and surveyed westerly from Clearwater River under Mr. Mahood.

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[12] Report of Progress, 1872, already cited, Appendix IV by Roderick McLennan, p. 47.

THE CARIBOO MOUNTAINS. Photograph by E. W. D. Holway.

THE WESTERN APPROACH TO KICKING HORSE PASS, MT. STEPHEN (10,523 ft.) AT THE RIGHT. Photograph by Howard Palmer.

This seems to be the only record of importance having to do with the highest part of the Cariboo range which is embraced within the one hundred miles between Albreda Pass and Goat River.[13]

Party Q under Mr. McLennan, which during the autumn of 1871 had worked its way up the Thompson River in the face of immense difficulties, arrived at Cranberry Lake early in October and went into winter quarters. In the course of the winter they "tried by several valleys for about twenty to twenty-five miles westerly, one or two places that seemed to promise an outlet," but they were eventually compelled to abandon the task as hopeless. This would appear to have occurred in the section near the headwaters of the present McLennan River.[14] The country hereabouts must be of exceptionally difficult character.[15]

Moberly's attempt to pierce the range at the head of Canoe River in the fall of 1873 has already been mentioned. The section here and at the head of the North Thompson was a critical locality for the railway, since lengthy detours would be saved if a direct westerly line could be obtained. Accordingly operations were continued in 1874. As soon as the season opened, Mr. E. W. Jarvis led a small party up the Clearwater River to the head of Lake Clearwater and thence easterly across a spur of the Cariboo range into the valley of the North Thompson, the latter portion of the journey very nearly coinciding with Moberly's reconnaissance of the preceding year. He found that the divide at the lowest place was 7,000 feet above sea-level and was occupied by an immense glacier.[16]

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[15] In the preface to "Peace River; a canoe voyage from Hudson's Bay to by Amos Bowman, Geological Survey of Canada, Vol. III, page 6C, 1887–1888. "Between the upper Fraser (Tete Jaune Cache) and the well-known Cariboo mining country—the distance is only fifty miles; yet very few prospectors or explorers besides Mahood of the railway exploration party in 1872 and Isaacs' prospecting party in 1886 have been through it."

[14] Report of the Royal Commission on the Canadian Pacific Railway, Ottawa, 1882, pp. 1530–32.

[15] In the preface to "Peace River; a canoe voyage from Hudson Bay to the Pacific in 1828," by Archibald McDonald, edited by Malcolm McLeod, the latter alludes thus to this journey of R. McLennan's: "It is a region which has hitherto been impenetrable, even, I believe, to the Indians," and adds that his father (Factor John McLeod, who had charge of the Thompson River District for the Hudson's Bay Co.) stated that up to 1823 his predecessors, who had been men of keen intelligence and great energy (including even Chief Factor Peter Skene Ogden), had failed in every effort to enter that region for trade.

From the foregoing it will be seen that while an immense amount of exploration was accomplished, it was mainly of a negative character. The topographical information obtained was only scantily transferred to maps and therefore has in great measure been lost. Had these surveyors also acted as topographers, the present maps would be far more adequate. During the two score years that have passed since their activities closed, very little more has been learned about the Cariboos, so that today they are essentially terra incognita, yet on the score of scenery, they comprise one of the finest areas of virgin territory remaining in British Columbia. The glaciers are numerous, intricate and of large size, and the peaks are lofty, several attaining an elevation of 11,000 feet. The area occupied by the highest mountains is about one hundred miles long and thirty miles wide, extending roughly from Albreda Pass and the head of the North Thompson northwesterly towards the great northerly bend of the Fraser.

Railway Progress.—Returning now to the story of the railway, in 1876, notwithstanding the great surveying and exploratory activities already referred to, the question of the route was still an open one, the terminal harbor on the Pacific had not been selected, nor had construction in British Columbia been begun. The terms of the Dominion Government's agreement to begin work in two years had been broken, therefore, and grave dissatisfaction was rife throughout the Province. This was not diminished by the apparent indifference exhibited by the Ottawa Government to its representations in the matter. So serious was the situation that the withdrawal of British Columbia from the Dominion was but narrowly averted by commencement of construction work in 1877.

There is no occasion to allude to the vicissitudes attending the railway enterprise during the years 1877–1880. It is enough to state that it became the foot-ball of politics and that its affairs were dictated mainly by the interests of the party in power. Finally the situation became intolerable and outraged public opinion demanded a thorough investigation. Accordingly, in June, 1880, a Royal Commission was sent from London with full inquisitorial powers. Its sittings extended through more than a year and in 1882 its findings were made public in three large volumes. Almost two thousand pages of testimony from scores of witnesses are set forth in extenso. The operations and results of the different surveying parties in British Columbia are fully described by the engineers in charge, Walter Moberly, Marcus Smith, Edward Mohoun, Roderick McLennan, etc. From the viewpoint of the historian or geographer it presents a record of unique interest.

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[16] Report of Progress, Ottawa, 1877, already cited, p. 118.

The presence of the commission did not by any means obstruct the progress of the railway project, for it was during its sittings (Feb. 1881) that a private corporation—the Canadian Pacific Railway Co.—was chartered and the whole enterprise transferred to it. By the terms of the transfer, the company undertook to construct the line between Red River and Kamloops, crossing the mountains by the Yellowhead Pass and the line already located, while the government was to build the section from Kamloops to Port Moody. Subject to the approval of the Governor-in-Council, the company had the right to locate the line of railway as they might see fit between Red River and Kamloops, which were fixed definitely as terminal points.

Notwithstanding the terms of the contract respecting Yellowhead Pass, that question was by no means considered settled, for in the report of the engineer-in-chief[17] covering the operations to November 1, 1881, he says: "In the Rocky Mountains a large staff of engineers has been employed all the summer in examining the several passes to the south of the Yellowhead, with a view to finding a more favorable passage than the line already located, but so far I have not learned that their efforts have been entirely successful." However, only seven weeks later he wrote Sir Charles Tupper, Minister of Railways and Canals, "There is a great probability that a passage through the Rocky Mountains will be discovered which will afford a much more direct and shorter communication with Kamloops than via the Yellowhead Pass." Eventually this prospect was realized and the present course of the railway through the Kicking Horse Pass determined, the charter of the railway being changed by an act of Parliament in 1882, to authorize the construction "by way of some pass other than the Yellowhead Pass provided it be not less than 100 miles from the United States boundary."

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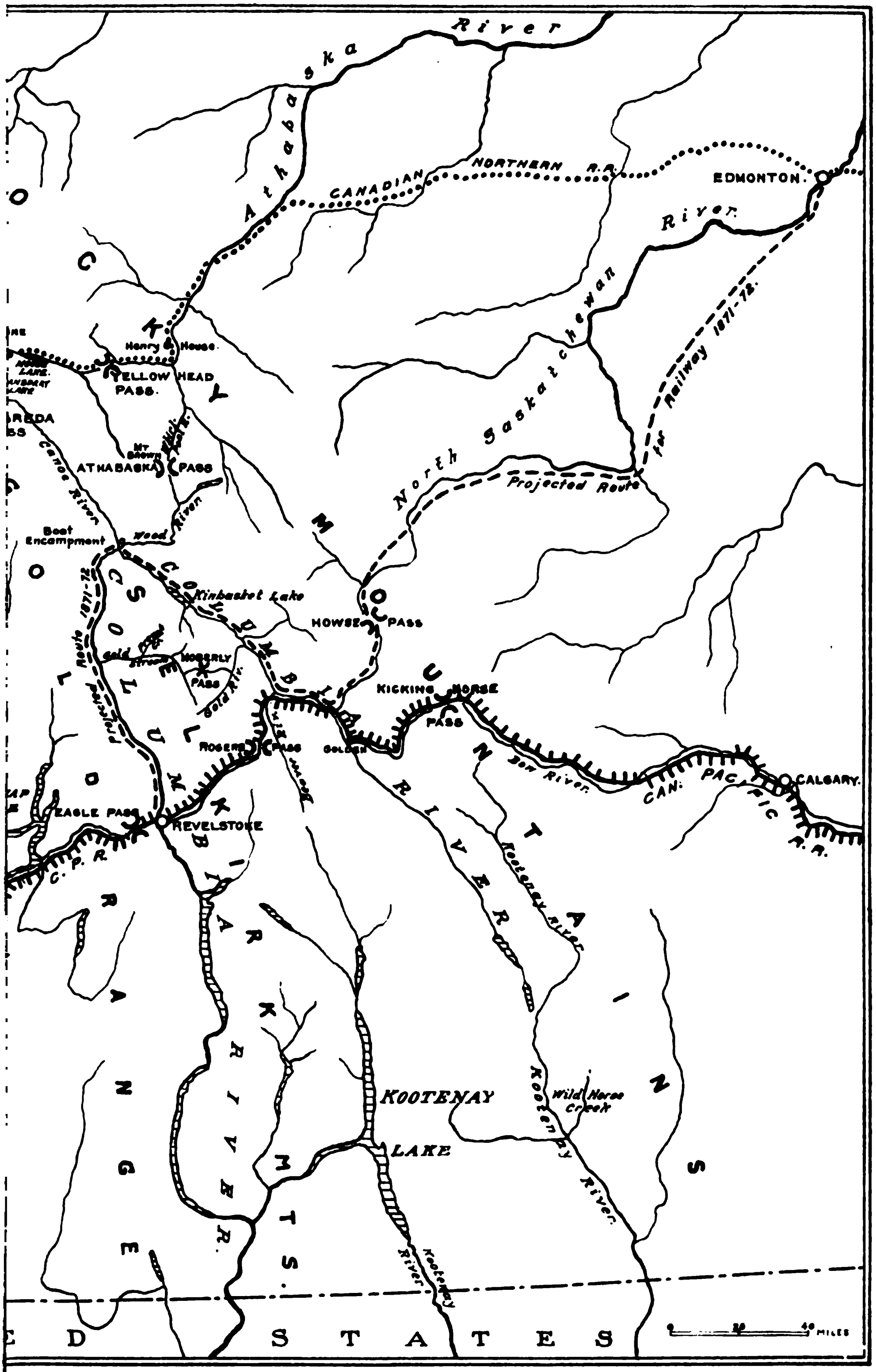
[17] In June, 1880, Mr. Collingwood Schreiber replaced Mr. Sandford Fleming as engineer-in-chief and at about the same time Major A. B. Rogers was selected as engineer of the mountain division.

The Kicking Horse and Rogers Passes.—Events now succeeded each other with remarkable rapidity. On July 24, 1882, Major Rogers discovered the practicability of the pass, now bearing his name, across the summit of the Selkirks, effecting a junction from the east with his investigations of the previous year up the Illecillewaet River. By the sixth of August he had returned to his base on the Columbia River. On September 15 the secretary of the company addressed a letter to Sir Charles Tupper requesting that the route via Kicking Horse Creek and across the Selkirk range via Beaver Creek be approved by His Excellency in Council. On September 26 the engineer-in-chief wrote as follows in his report to the Department of Railways and Canals:

"From Moose Jaw Creek to Fort Calgary . . . the company, I am informed, have made a location with a view to passing through the Kicking Horse Pass. This location has not been approved but the company apparently have great faith in the existence of a feasible way through the mountains in the direction indicated, having commenced construction of a line on this location. I presume they have assumed the responsibility, not desiring to check their unprecedentedly rapid construction and feeling assured by information already obtained from their engineers that they will succeed in finding a favorable passage via Kicking Horse Pass. Several parties of engineers under Major Rogers have been busily engaged during the summer in surveying this pass; and the company informs us that they expect reports from him which will, they believe, definitely settle the route."

The real reasons underlying the abandonment of the Yellowhead Pass route, despite the great efforts and sums lavished upon it, have never been disclosed. It has been hinted that considerations of political expediency made it unwise for the new government, recently ushered into power, to become associated with a scheme about which such unsavory memories clung. A new plan, a fresh start and a different line were therefore important desiderata. Other considerations of undoubted influence were favorable reports on the fertility of the soil and the extent of grazing lands along the Bow River which previously had been considered of a barren character. Again



ing the Natural Features controlling the location of certain Railway
c Railway. The present Canadian Northern Railway is built upon the
lway.

the decided shortening of the line by the utilization of the Selkirk pass (about 120 miles) must have been an important factor.

By the end of 1882 the final location was completed from the Kicking Horse Pass easterly along the Bow River for forty miles, and westerly down the steep grade towards Field for eight miles. The following February the final location was extended to Calgary and in September the line was actually in operation for forty miles to the west of that place. More than 25,000 men were employed in 1883. By November the location had been perfected down through the Kicking Horse Canyon along the Columbia River and thence to the summit of the Selkirks, whilst a preliminary survey had been extended as far as the present town of Revelstoke.

Thus the end came in sight, for from the latter place westerly, surveys had long since been perfected. It only remains to allude to the closing scene of the great drama—the final meeting of the rails at Craigellachie near Eagle Pass. This occurred on November 7, 1885, and the first through train went forward to the Pacific on that day. It was not until the following year, however, that regular trans-continental service was begun. On June 28 the first passenger train left Montreal for Port Moody, where it arrived July 4 on schedule time.

SOME PACIFIC OCEAN ISLETS APPERTAINING TO THE UNITED STATES.

A BRIEF HISTORICAL AND DESCRIPTIVE NARRATIVE.

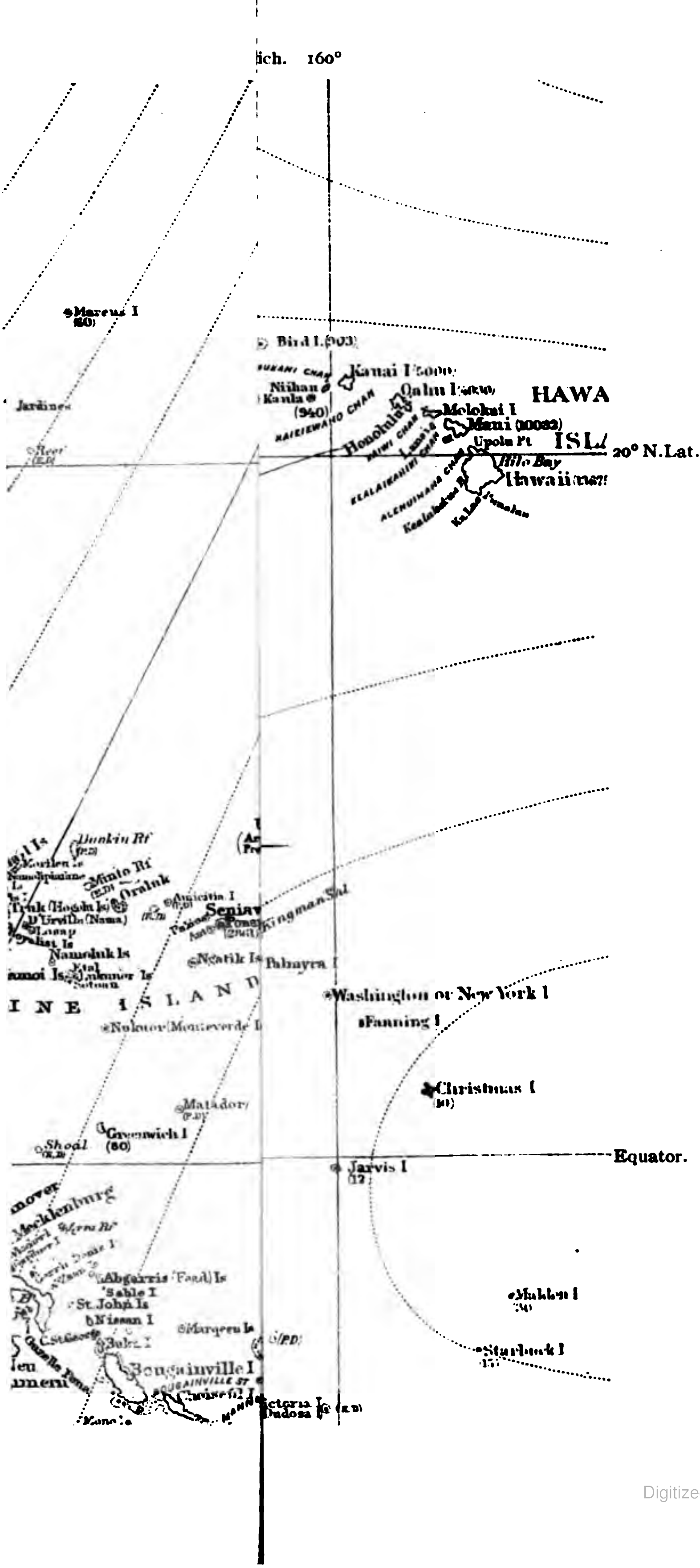
MEDICAL INSPECTOR CLEMENT BIDDLE, U. S. NAVY.

Few people of our country are aware of United States ownership of sundry islets dotted about the Pacific Ocean, chiefly near the equator, which have unexpectedly come under American jurisdiction in the last sixty years on account of the guano thereupon found. Many of these islets were discovered by American ship captains, as we shall see later on, who in voyaging about the Pacific happened upon them quite by accident, little thinking they contained the valuable guano. Controversies and disputes soon arose among the floating population of these islands, as to sovereignty and the right to work the beds, whereupon Congress by virtue of American discovery found it expedient between 1856 and 1872 to enact various laws for the settlement of such questions as might arise to trouble the lives of the first-comers.

These statutes relate to the claim of the United States to the islands; notice and proof of discovery; completion of proof; exclusive privilege of the discoverer; restrictions upon exportation and regulation of the guano trade; criminal jurisdiction; employment of land and naval forces; and the right to abandon an island. All in all, quite enough legislation, one will say, to take care of such unusual possessions.

The most important of these laws were passed in 1856, and at once described the actual status of an American citizen and discoverer. Here are extracts from them:

"Whenever any citizen of the United States discovers a deposit of guano on any island, rock, or key, not within the lawful jurisdiction of any other government, and not occupied by the citizens of any other government, and takes peaceable possession thereof, and occupies the same, such island, rock, or key may, at the discretion of the President, be considered as appertaining to the United States."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Nissan I
Marqueen Is
Buka I
Bougainville I
BOUGAINVILLE ST
Choiseul I
Victoria I
Dudosa I
Malden I
Starbuck I

Then follow directions to the discoverer, who is enjoined to give notice to the Department of State of such discovery, laws about the guano trade, and precise regulations concerning offenses and crimes committed, winding up with the proviso that after the removal of the guano "Nothing in this Title shall be construed as obliging the United States to retain possession of the islands, rocks, or keys, after the guano shall have been removed from the same." Uncle Sam seemed, therefore, quite unwilling to saddle himself perpetually with an unproductive terrain, and provided accordingly.

I take the following interpretations and regulations relating to the guano islands from the International Law Digest of 1906: The President may in his discretion regard the discovered guano islands as belonging to the United States, but he is not compelled to do so. He cannot annex a guano island while a diplomatic question is pending as to the ownership between the United States and a foreign government. The right of citizens of the United States to use and control under the Revised Statutes of deposits of guano on islets, rocks, and keys is based on the discovery, not of the island but of the deposit of guano thereon. It must be shown that the deposit is not within the lawful jurisdiction of any other government, nor in its possession. Before an island can be declared as appertaining to the United States for the purpose specified in the Guano Act of 1856 proof must be furnished to the Department of State not only of the fact of its discovery but also of its actual, continuous, and peaceable occupation, by a citizen of the United States accompanied with a reliable estimate of the quantity of the guano on the island and an analysis of its quality by a reputable chemist. After which the President may, in his discretion, the statutes having been complied with, regard the island or islands containing the discovered deposits as appertaining to the United States. Inasmuch as a bond is required by the government to control the working of the bed, the President may nominate the sum, but he must be fully informed as to the value of the deposit.

The United States government does not grant protective rights to the alleged discoverers of guano islands. It simply makes the State Department the depository of such papers as the discoverers may choose to place upon its files. The only action the United States can be expected to take in the event of any of its citizens becoming embroiled in a controversy with a foreign government with regard to ownership of guano deposits is to use its diplomatic interference to redress the wrongs inflicted upon its citizens "should they not have transgressed the laws of a foreign nationality."

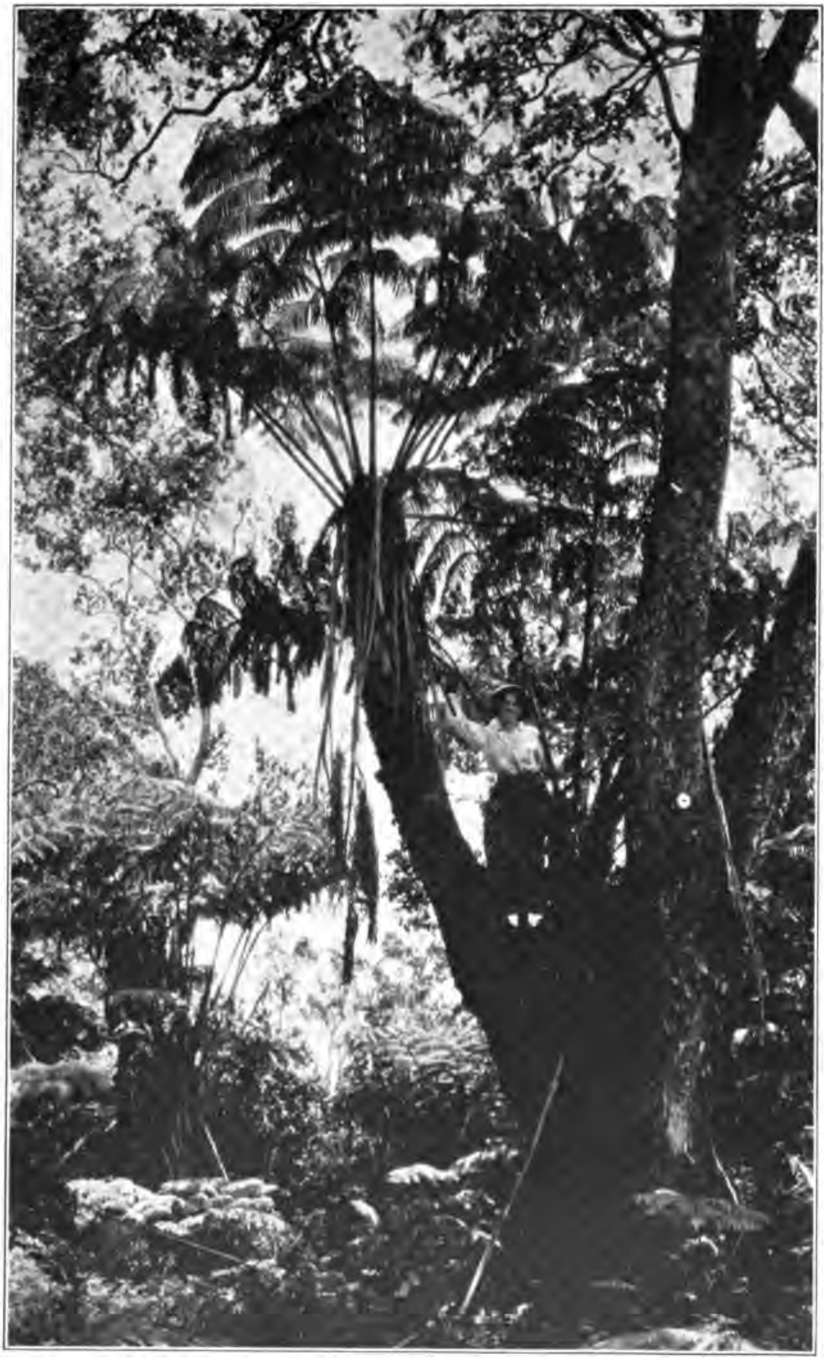
The Mexican government has insisted, from time to time, that certain of these islands are within its territory and lawful jurisdiction under the terms of the original act of Congress, and that they never could have been "considered as appertaining to the United States." This claim has not been recognized by the Washington government.

The discoverer, when the terms of the statute have been fulfilled, acquires for himself and assigns "during the pleasure of Congress, the exclusive right of working and disposing of the guano," subject to the conditions and limitations prescribed by law. The guano used is to be exportable only to citizens of the United States, and for use in the same country, the discoverer being a citizen—but this regulation has been wisely suspended.

"The Department has no power to determine disputes between citizens of the United States in respect of their rights in a guano island and the claimants must vindicate their title before the legal tribunal of the country." This meant that in the event of such a controversy arising the case would have to be transferred to the nearest U. S. Federal Court for trial, probably in San Francisco.

Before going on to write in detail of these islands let me here say that guano is a valuable excrementitious fertilizer composed of phosphatic and nitrogenous matters, deposited on certain tropical or semi-tropical coral islands by marine birds, such as pelicans, gannets, cormorants and petrels, which repair thereto in vast numbers to lay and hatch their eggs. The guano islets for the most part are found either in the Polynesian or Micronesian groups of Oceanica.

In geological formation the Pacific islands, both large and small, are either volcanic or coral. The former are usually lofty in proportion to their size and even now show frequent or constant evidence of eruptive activity (Tonga, New Hebrides and Kilauea in Hawaii); on the other hand those of coral composition are flat, with a fringe of cretaceous encircling reefs, occur in islet-groups, rise but little above sea-level, sometimes growing cocoanut trees, take the form of an atoll (a Malayan word meaning a ring of coral surrounding a lagoon), and usually enclose a lagoon. They are found on either side of the equator between latitude 30°, north or



Tree Ferns which grow to a Height of 30 or 40 Feet. These ferns are near Volcano House near the Kilauea Crater, Hawaii.

Pineapple Field near Honolulu.

south, one degree on this part of the globe being equal to about 60 miles.

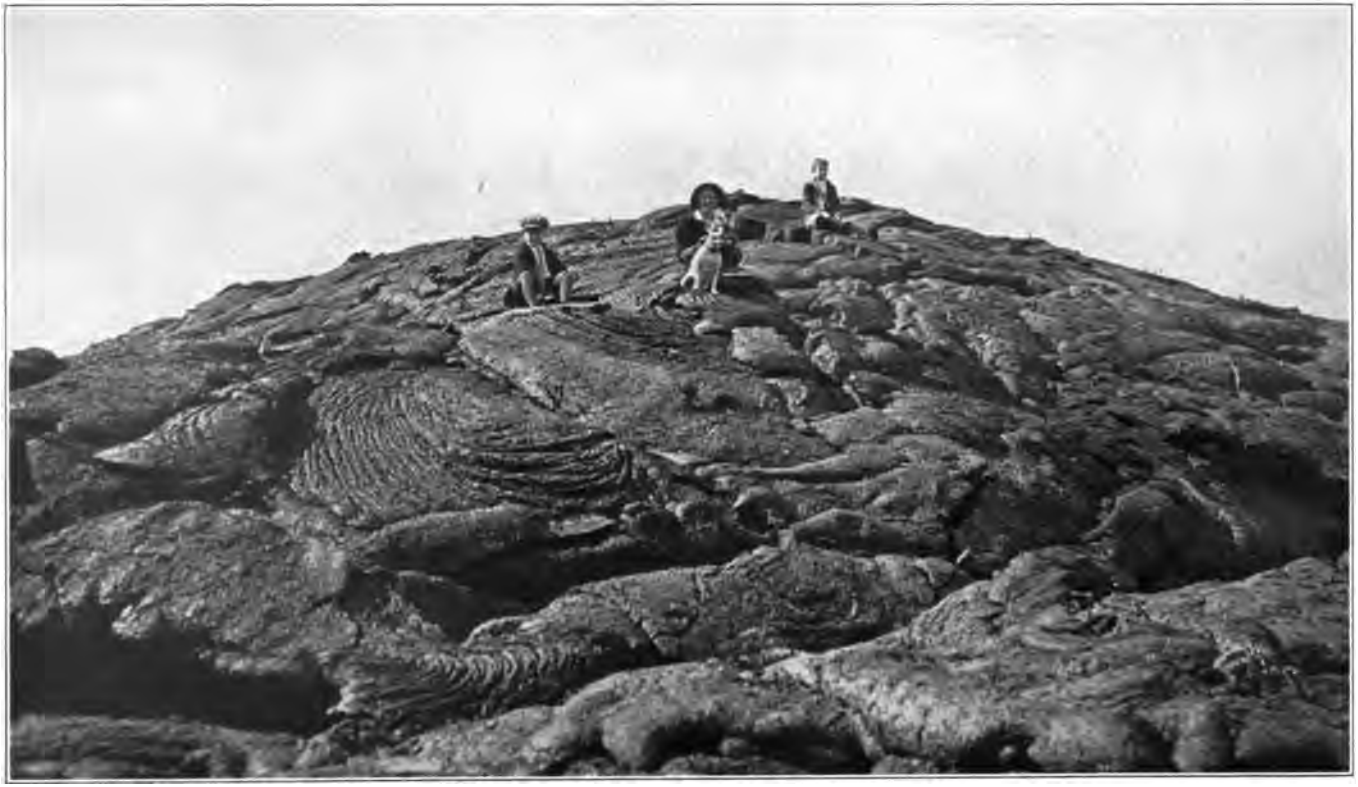
I submit here certain information taken from a report of the Treasury Department, together with other data obtained elsewhere, relating to the legal status and commercial value of these islets, acquired by or appertaining to the United States. In one of these communications the following phraseology is used: "The sovereignty and jurisdiction of the United States have attached to the territory embraced in a number of islands," meaning of course the guano islands of the Pacific inasmuch as their names are appended to this document. The number of islands in this list extends to 50, notwithstanding the British government claims many of them, indicating her ownership by the letters Br. affixed to the claimed territory. As none of the islands in this list has been bonded, in accordance with U. S. law, since 1885, or possibly to 1893, for the purpose of obtaining legal permission to remove the guano, it seems altogether likely they have been abandoned so far as this enterprise is concerned. Let me give here some of their names: They are Baker's, Jarvis, Howland, McKean, the Phoenix group (8), American group (4), Flint, Gardner's, Midway, Wake, etc.

Baker's Island (or New Nantucket).—Coral formation, some 30 miles north of the equator and 3,725 miles from San Francisco; 1 mile long, east and west, ¾ mile wide, north and south; 20 feet high; surrounded by a reef 200 to 400 ft. wide; no fresh water on the island. Vegetation is coarse grass and dry brush, without trees; no harbor, but there is a landing wharf and short road. The surf breaks heavily on the eastern end and s.w. point and there are heavy tide rips eastward of the island extending some distance from the land. The guano deposits were nearly worked out in 1872. Leased to the Pacific Islands Co., under British protection. In 1914 reported uninhabited. Marked on the map "U. S."

Howland Island (or Newlands).—Coral formation, 25 miles to the westward of Baker's, 18–20 feet high; surrounded by a fringing coral reef; island is 2 miles long north and south, and ½ mile wide; slightly brackish water is got by digging a few feet; there is a little grass on the ridge and a clump or two of bushes near the center of the island. In 1872 the amount of guano was estimated to be 20,000 tons. Leased to the Pacific Islands Co.; and is under British protection. No information forthcoming (1918) as to the working of the guano beds or if the islet be inhabited. Marked on the map "U. S."

Christmas Island.—One of the American group (there is another Christmas island in the Indian Ocean, south of Java); about 75 miles north of the equator, in mid-Pacific and 3,200 miles from the Central American coast; coral formation, discovered Christmas Day, 1777, hence the name; dimensions 40 miles by 35 miles, average width 35 miles; at the western end 3 or 4 feet high; breakers here seen before the land; the strong currents about this island have caused many wrecks upon it. Two beacons have been erected on the island, one at East Point, the other on the South East Point. A cairn has been built at the N. W. point where schooners now find a fair anchorage, and a good landing. On the western side there is a narrow, shallow pass into the lagoon, but this basin is studded with coral rocks, and is shallow and dangerous. Vegetation is a scrubbly growth of cocoanut, more of which trees are being planted, the original growth having nearly all disappeared. Small settlement at North Point; water supply uncertain, depending on rainfall. By digging brackish water is found, good enough for cooking, and which will sustain life for a short time. Following the planting of the cocoanut trees, the export of copra, the dried kernel of the cocoanut from which a valuable oil is extracted, is said to be on the increase. Fish are plentiful, and a few turtles are taken; sharks give trouble to the shell-divers. This elysium is under lease for 99 years from 1 January, 1902. In 1908 there were no inhabitants; there is no regular steamer communication.

Marcus Island.—A coral island in the mid-Pacific with a fringing reef; about 200 miles north by east of the Hawaiian group; latitude 24° 14′ north; long. 154° 0′ west. It is classed with the Micronesian islands; its shape resembles an isosceles triangle, being ⅞ mile at the base, and 1⅛ miles to apex, and in size it is therefore typically Micronesic. It was taken possession of by Captain A. A. Rosehill, an American shipmaster, on June 29, 1889, who raised the U. S. flag upon it, seizing the islet under the guano island act (1856) and filing the required bond. (No record of this in the Treasury Dept's letter of 1893). Subsequent investigation showed that the Japanese government had by usufruct (right to use without ownership) from September, 1898, given the use of the island to



Detail of Cold Lava of the Lava Field of Kilauea.

A TYPICAL PACIFIC ISLAND SCENE (HAWAII).

one of its subjects. Since this date the U. S. government has not claimed title to or asserted sovereignty over the island.

Jarvis Island.—A coral island 1¼ miles by 1¾ miles, just south of the equator (25 m.) and some 3,000 miles from the Central American coast. It appears as a white sandy beach 10–12 feet above the sea, covered in part with a few patches of grass, some bushes but no trees. The lagoon has disappeared, leaving its bed 7 or 8 ft. above the sea. It is a Polynesian island.

It is supposed to have been first discovered by the ship "Eliza Francis" (flag not named) as long ago as 1821; again in 1835 by Michael Baker (probably a sea captain) and subsequently by one Lucas. It is marked on the maps as a British possession; nevertheless it is borne on the list of guano islands as belonging to the United States, having been bonded in 1856. The island was visited in 1858 by the U. S. Ship "St. Mary's," Captain Davis, who took formal possession in the name of the United States. In 1861 a certificate was issued by Secretary of State Black to the American Guano Co. of New York, as assignee of Michael Baker, the original discoverer. However, this act did not deter claimants from seizure, for in 1889 H. M. Ship "Cormorant" appeared and took possession of Jarvis, so that at this period the islet seemed to live under dual ownership. Notwithstanding this apparent conflict of authority, as late as September, 1893, the islet was reported as appertaining to the United States "in a list of our guano islands by the 1st Controller of the Treasury to the Asst. Secretary of the Treasury."

Johnston's Island.—Sometimes known as Cornwallis or Smith's. Lat. 16° 46′ n., long. 160° 17′ w., an isolated islet in the mid-Pacific, approximately 900 m. west of the Sandwich islands, its nearest neighbor. The circumstances of the discovery and taking possession of Agnes and Johnston islands are fully given in an opinion of Attorney-General Black, so long ago as 1859. It appears to have been bonded in that year, showing that someone was there after the guano by legal means. In 1859 the American schooner "F. Cooper" examined the island. The original discoverer was Wm. H. Parker who gave bond. At one time the Pacific Guano Co. of San Francisco claimed possession. In 1892 Johnston Island was formally annexed to Great Britain by H. M. S. "Champion," without any representations or objections on the part of the U. S. government. Very few data are obtainable on this islet. It is borne on the list of U. S. guano islands but there is no question that the Washington government has completely surrendered all sovereignty to this territory.

Lobos Islands.—Lie 20–30 miles off the coast of Peru; were visited in 1822 by Captain Morrell, an American navigator; contain guano. They were formerly claimed by the United States, but Peru having made good her title in 1852, an order was issued countermanding the authority issued to American vessels to protect their interests in taking cargoes of guano from the island, and the United States afterward withdrew "unreservedly" all objections to Peru's title.

McKean Island.—One of the Phoenix group, some 240 miles south of the equator and 3,900 miles from the Central American coast, and therefore a typical mid-Pacific island. Formed of coral and sand, 20 ft. high, ¾ m. long and ½ m. broad, and covered with a growth of bushes. Is leased to the Pacific Islands Co.

The Phoenix Group.—Consists of eight scattered islands, marked as belonging to Great Britain. Nevertheless several of them are borne on the official list of U. S. possessions. No evidence that any of them was ever bonded under U. S. law. They are low scattered islands in the mid-Pacific, some 250 m. south of the equator, of coral formation, surrounded by fringing reefs. Their valuable supply of guano has been worked out. On most of this group no water or supplies is obtainable. Very little rain falls on Enderbury island. There is a little vegetation on Sydney and Hull islands. Gardner's island of this group contains the usual lagoon but with no passage to the sea. The height of the latter, including trees, is 50 feet. Has been planted to cocoanuts. It is borne on the official list of U. S. guano islands, but has never been bonded. British protectorate proclaimed May, 1892, and in 1899 it was leased to the Pacific Islands Co. The Phoenix group is classed with the Polynesian islands.

Fanning Island.—One of the American group, the population of which is estimated to be 200. It is marked British on the map, notwithstanding the fact that this group is borne on the official list of U. S. guano islands, but there can be no doubt of its sovereignty appertaining to Great Britain. It is in mid-Pacific, about 235 m. north of the equator, was discovered in 1798 by Edward Fanning, is of atoll formation, and thickly covered with cocoanut trees, 60–90

Surf Riding at Waikiki. (Photo by Doubleday, Page & Co.)

A South Sea Fishing Party.

South Sea Islanders.

The Isles of the Blest; the South Seas.

feet high. It is 9 m. in length, 4 m. wide and 2 to 3 ft. high, surrounded by a coral rim 10 ft. in height, which forms a kind of breakwater.

English harbor is the entrance on the southwest side, the only ship entrance. Formerly guano of an inferior quality was taken out, but it has either been exhausted or ceased to pay, and has been abandoned. Pearl oysters are found in the lagoon and are a source of profit. A schooner calls there yearly for the copra, but the supply is diminishing. Coal may be had, poultry usually and cattle occasionally. The well water is excellent and plentiful and fish, snipe, duck and curlew may be caught and shot. In 1901 the population consisted of 1 European and 46 Gilbert Islanders, the latter being engaged in collecting copra. In 1902 cable communication was established between Vancouver and Fiji. There is a good harbor for steamers; indifferent for sailing vessels. An iron jetty has been built at English harbor. The fresh water in the wells rises and falls with the tide. Steamers of the Union Co. call bi-monthly. Washington island, another of the American group, is 75 m. north of Fanning; discovered in 1798; 3½ m. long and 1½ m. wide; 10 feet above the sea; in eastern part of island there is a lagoon of fresh water. The island is covered with a luxuriant growth of cocoanut and other trees. Lagoon water unwholesome. The guano on this island is not worked. The village is at the west end of the island. The soil is rich and productive. A fringing reef extends 1,000 yards off the eastern end. In 1901 there were 96 men and women and 42 children on the island. A heavy surf makes the landing dangerous.

Palmyra Island.—Another of the American group, at the north side, with nothing to mark its sovereignty. It is however borne on the list of U. S. guano islands, though never bonded. It is an atoll and was discovered by the American ship "Palmyra" in 1802. Taken possession of by the United States in 1912 and thenceforth became a part of the territory of Hawaii. It lies northwest of Washington island, and consists of many small islets. It is 5¼ m. by 1½ m., and therefore will not add much area to the Sandwich group. The atoll encloses three distinct lagoons, without openings to the sea. Its highest point is but 6 ft. above the sea, and covered with bushes and tall cocoanut trees. There were no inhabitants in 1892. Landing difficult on account of innumerable coral reels. A former resident of five months' duration said rain was almost constant. Fish are abundant, turtle scarce. On one of the eastern islets there is a small pool containing rain water.

Wake Island.—A lonely Micronesian island in the mid-Pacific, several hundred miles north of the Marshall group, its nearest neighbor; in approximately lat. 18° 30′ n., and long. 172° w. In 1914 it was reported small, barren and uninhabited save for periodical visits of Japanese fishermen and bird hunters. It is about 1,100 m. north of the equator. It is marked on the map "U. S."

Midway Island.—In the North Pacific and outside the tropics and considerably northwest of the Hawaiian group (1,200 m.). In 1914 the following report was made. "Midway has an area of about ten square miles and is practically barren of vegetation. It was uninhabited until 1903, when the Commercial Pacific Cable Company established a station there. Its trade is, of course, limited to the supplies required for the employees of the Cable Company living there." It is the relay cable station between the Pacific coast, Guam and Manila. A small Marine Corps garrison used to be stationed on this island, and it is, of course, a real United States possession, the only other one apparently being Palmyra.

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BOOK REVIEWS.

Muir, John. *The Cruise of the Corwin.* Pp. 271. Illustrated. Boston and New York, Houghton, Mifflin Company, 1917. $2.75 net. Presented by the Associated Mountaineering Clubs.

In May, 1881, the U. S. revenue cutter *Corwin* was dispatched north from San Francisco to obtain tidings of the ill-fated Jeannette Expedition, which had disappeared in the Arctic mists north of Alaska.

John Muir accompanied the *Corwin* as scientific observer, and the book embodies his notes on the fauna, flora and native tribes encountered on the cruise through Bering Sea and the Arctic Ocean—besides a more detailed report on the glaciation of the Arctic lands visited. Readers familiar with other works of the author, will find reflected in this narrative the same buoyant spirit, keen observation and sympathy with nature which characterize all his writings. Muir formed one of the party which made the first landing on Wrangel Island and surprised his comrades by his easy ascent of the heights of Herald Island. An illuminating introduction is furnished by the editor, Dr. Badè, and the author's sketches together with appropriate photographs enhance the value of the volume. H. G. B.

Eaton, Walter Prichard. *Green Trails and Upland Pastures.* Pp. 303. Illustrations in color. Doubleday, Page & Company, 1917. Price $1.60.

Felicity of phrase, beauty of thought, sympathy for men and the lower animals, come with this book. It is a nature-chronicle mainly of the Berkshire Hills, but also with considerable description of Glacier Park. Nineteen essays compose the volume, with such titles as "The Cohorts of the Frost," "The Skirmish Line of Spring," "Where Glaciers Feed the Apple Roots."

Mr. Eaton is not a second Burroughs. He has surpassed Burroughs in happy expression, and in true love for the wild life. A killer may be an observer of birds and animals but surely not their lover. This writer would rather study the deer and the partridge than shoot them. "Why must it forever be a temptation to pull a trigger?" he asks in his section on "The Harvest of the Wild Places."

A class in physiography might well read and profit by a portion of "Below the River Bank." It would not hurt to see typical features of a river's course through the magic spectacles of a really good writer. "The Little Town on the Hill" furnishes an object lesson on the decay of many a New England village of the western uplands. Mr. Eaton suggests that these uplands would now serve the country best as forest reserves.

The colored illustrations add nothing to the charm of the book. Most of them seem rather crude or elementary. Good photographs would be much preferable, and would more simply help to express one of the fundamental thoughts of the writer: "In the fever of our modern life we cannot return to Nature too intimately." WALTER LEFFERTS.

The Melody of the Earth, an Anthology of Garden and Nature Poems from Present-Day Poets. Selected by Mrs. Waldo Richards. Houghton Mifflin Company, 1918.

Pan is not dead after all. On the contrary he was never more alive or more musically alert than he is at this moment when, it must be confessed, the clouds are pretty thick and the woods decidedly dark. But the sun still shines beyond, and at times through, them, and the old strain still goes on unbroken since human emotion first responded to the call of the changing seasons and the flowers that bloom in the spring. The old notes still ring as true as ever and there are new ones too. The pipes are the same but the organ is freshly voiced from time to time, and whether the tunes are cheery or sad the world still listens as eagerly as ever. If you doubt it read Mrs. Richards's very much up-to-date anthology and be reminded how perennial is the charm and how constant is the call of the music that has constituted the cradle song of the world since there was any world of the kind that we know.

L. W. M.

GEOGRAPHIC NEWS AND NOTES.

E. H. Bowill, of the U. S. Weather Bureau, has been commissioned a major in the Signal Corps, to be assigned to General Pershing's staff to forecast weather for military purposes. Dr. W. R. Blair, meteorologist, has been put in charge of aërological work, to take charge of observations of the upper air for immediate use of aviators, artillerists, etc. This meteorological work will be done not only at the front in France, but also at the military camps in the United States.

To Sir Aurel Stein has been awarded the Tchihatchef Prize of the Paris Académie des Sciences for his geographical researches. *The Geographical Journal* of the Royal Geographical Society has published his frequent addresses before that body. He is one of the foremost authorities on Central Asia.

Theodore de Booy, assistant curator of the American Section of the University of Pennsylvania Museum, who has lectured before our Society, is heading an expedition which has gone to South America to explore the Sierra Pareja Mountains in Venezuela, where it is rumored that in a region unvisited by civilized mankind a white tribe dwells among the Indians.

"The Jordan Valley and Its Lakes," by Dr. E. W. G. Masterman, is the leading contribution to the *Geographical Journal* for April. The successful expedition of the army of General Sir E. H. H. Allenby has re-awakened public interest in the historical geography of the Holy Land. "Were there no history and no Bibilical associations connected with it," says Dr. Masterman, "the Jordan rift would be well worth our study as a unique geographical region."

According to "Science," "the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, in accordance with a request from Captain Roald Amundsen, has supplied for use in his forthcoming Arctic expedition a complete set of magnetic instruments, as also the necessary directions for magnetic measurements and the program of work. Captain Amundsen plans to leave Norway next summer, and has made arrangements on the expectation that his expedition will require about five years for completion. He will make scientific observations of various kinds in the Arctic regions. During a visit by Dr. Nansen and Captain Amundsen to the laboratory of the department on April 5, the final details with regard to the contemplated Arctic magnetic observations were arranged."

ACTIVITIES OF THE SOCIETY.

MOUNT KATMAI.

BY PROFESSOR ROBERT F. GRIGGS.

Professor Robert F. Griggs, of the University of Ohio, was the speaker on the evening of Wednesday, April 3. He took for his theme "Mount Katmai and the Valley of Ten Thousand Smokes," and his lecture was profusely illustrated.

ITALY IN THE WAR.

BY PROFESSOR CHARLES UPSON CLARK.

"Fighting Above the Clouds: Italy's Part in the War," was the theme of a thrilling address on the evening of Wednesday, May 1, by Professor Charles Upson Clark, of the American Academy in Rome. The lecture was illustrated copiously, with motion pictures especially prepared, and with lantern slides.

ELECTION OF OFFICERS.

The annual election of officers was held May 1, and resulted as follows: *President,* Prof. William E. Lingelbach; *First Vice-President,* Mr. Henry G. Bryant; *Second Vice-President,* Prof. Leslie W. Miller; *Recording Secretary,* Dr. J. E. Burnett Buckenham; *Corresponding Secretary,* Dr. Paul J. Sartain; *Treasurer,* Mr. William K. Haupt; *Directors,* Dr. Florence Bascom, Miss

Laura Bell, Mr. Henry Paul Busch, Dr. Judson Daland, Mr. Howard Longstreth, Mr. Thomas Raeburn White; *Excursion Committee,* Miss S. E. Patterson, Mr. William Paxson String, Miss Mary G. Tyler, Miss Helen Tuxbury; *Reception Committee,* Miss Elizabeth Bunting Collier, Mrs. Henry T. Dechert, Mrs. Charles Roberts, Dr. Lucy L. W. Wilson.

The committees as now constituted for 1918–1919 are as follows: (1) *Executive Committee,* as prescribed by the By-Laws; (2) *Finance Committee,* Mr. Howard Longstreth, Chairman, Mr. Howard Fuguet, Mr. Wm. K. Haupt; (3) *Entertainment Committee,* Mr. E. Marshall Scull, Chairman, Miss Laura Bell, Dr. Clement Biddle, U. S. N., Dr. Judson Daland, Miss Mary S. Holmes; (4) *Publication Committee,* Mr. Henry G. Bryant, Chairman, Dr. Wm. Curtis Farabee, Mr. E. Marshall Scull; (5) *Library Committee,* Dr. Wm. Curtis Farabee, Chairman, Dr. Clement Biddle, U. S. N., Mr. Henry Paul Busch; (6) *Membership Committee,* Mr. Thomas Raeburn White, Chairman, Dr. Florence Bascom, Miss Laura Bell, Mr. Henry G. Bryant, Mr. Henry Paul Busch; (7) *Reception Committee,* Miss Laura Bell, Chairman, Miss Elizabeth Bunting Collier, Mrs. Henry T. Dechert, Mrs. Charles Roberts, Dr. Lucy L. W. Wilson; (8) *Excursion Committee,* Mr. Samuel Scoville, Jr., Acting Chairman, Miss S. E. Patterson, Mr. Wm. Paxson String, Miss Helen Tuxbury, Miss Mary G. Tyler; (9) *Study and Research Committee,* Prof. Leslie W. Miller, Chairman, Dr. Florence Bascom, Dr. Wm. Curtis Farabee, Prof. G. B. Roorbach.

EXCURSIONS.

The Excursion Committee, of which Mr. Samuel Scoville, Jr., is chairman, arranged a "bird walk" on Friday, May 24, in the vicinity of Broomall, concluding with a picnic supper, and a trip to Rosemont and the Italian Gardens of Mr. Alba B. Johnson on Saturday, June 15.

ACCESSIONS TO THE LIBRARY.

Science and Learning in France, published by the Society for American Fellowship in French Universities. 1917. Profusely illustrated. Pp. 454. Presented by Mr. Henry G. Bryant.

Pearson, T. Gilbert. *The Bird Study Book.* Pp. 257. Ilus. Garden City, Doubleday, Page & Co. 1917. Price $1.25 net. Presented by the Publishers.

Johnson, Douglas Wilson. *Topography and Strategy in the War.* Pp. 211. Illustrations and maps. New York, Henry Holt & Co. 1917. Price $1.75 net. Presented by the Publishers.

Wood, Edwin O. *Historic Mackinac.* 2 vols. Pp. 1470. Illus. New York, Macmillan Co. 1918. Price per set $12.50. Presented by the Publishers.

Schoenrich, Otto. *Santo Domingo, A Country with a Future.* Pp. 418. Illustrated. New York, Macmillan Co. 1918. Price $3.00. Presented by the Publishers.

Bell, Archie. *Sunset Canada.* Illustrated. Pp. 320. Boston, The Page Co. 1918. Price $3.50; carriage paid, $3.85. Presented by the Associated Mountaineering Clubs.

Butler, Frank Hedges. *Through Lapland with Skis and Reindeer.* Pp. 286. Illustrations and map. New York, Frederick A. Stokes Co. Price $4.00 net. Presented by the Associated Mountaineering Clubs.

Rinehart, Mary Roberts. *Tenting Tonight.* Illustrated. Pp. 188. Boston. Houghton, Mifflin Co. Price $1.75 net. Presented by the Associated Mountaineering Clubs.

Miller, Warren H. *Camping Out.* Illustrated. Pp. 322. New York, Geo. H. Doran Co. 1918. Price $1.50 net. Presented by the Associated Mountaineering Clubs.

Fenger, Frederic A. *Alone in the Caribbean.* Pp. 353. Illustrated. New York, Geo. H. Doran Co. Price $2.00 net. Presented by the Associated Mountaineering Clubs.

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The Bulletin

OF THE

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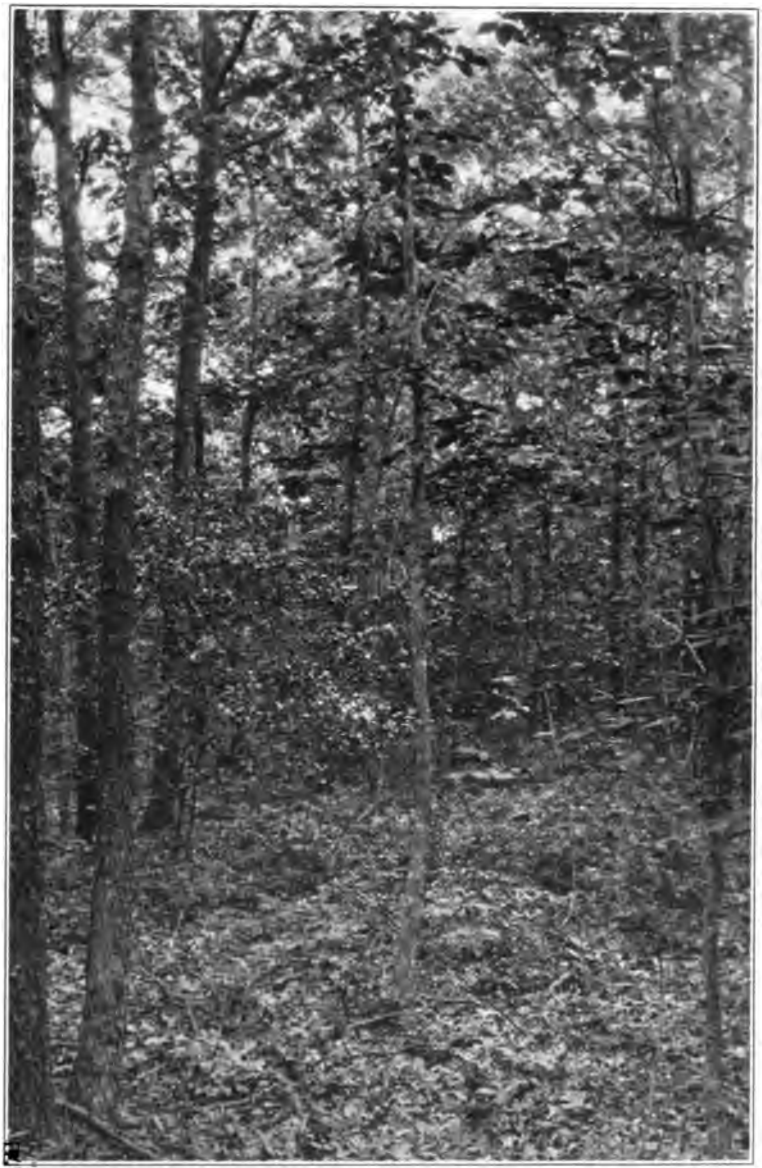

INTERIOR OF OAK FOREST NEAR BENNETT, CAPE MAY CO. June 26, 1917.

A SKETCH OF THE FOREST GEOGRAPHY OF NEW JERSEY.

ROLAND M. HARPER.

Introduction.—The state of New Jersey embraces within its borders a great variety of forests and other vegetation, which have been studied in considerable detail from several different standpoints. Resident botanists, as well as many from New York, Philadelphia, and various other places far and near, have traversed the state in all directions during many decades, collected and identified the trees and other plants, and traced their distribution more or less minutely; so that additions to the known flora of any considerable portion of the area are now comparatively infrequent. The vegetation of some parts of the state, particularly the pine-barrens and the coast strip, has also been studied in its relations to environment, by ecologists, who have brought out some interesting principles thereby. And in addition to this purely scientific work, foresters have estimated the area of the woodland in almost every township, as well as the stand of timber per acre and in some cases the rate of growth. The results of all these investigations have been set forth in numerous easily accessible publications.[1]

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[1] The principal taxonomic and floristic works of interest in this connection are Dr. N. L. Britton's catalogue of plants of the state, published in Vol. 2 of the "Final Reports" of the State Geologist in 1890; Dr. B. D. Halsted's copiously annotated list of trees, chiefly a compilation from Britton's Catalogue and a few other state publications, constituting Bulletin 202 of the New Jersey Experiment Station, 1907; Witmer Stone's "Flora of Southern New Jersey," which makes up the greater part of the Report of the State Museum for 1910; and Norman Taylor's "Flora of the Vicinity of New York," published by the New York Botanical Garden in 1915, which covers the whole of New Jersey and considerable other territory. Stone's work (reviewed by the present writer in *Torreya* 12: 216–225, Sept., 1912) is one of the best local floras ever published for any part of the world, and might be classed also among the ecological works, on account of the detailed information it gives about the habitats of the plants. It contains references to all the important previous literature pertaining to the same regions. Taylor's "Flora" has the

With such a wealth of published material available one might suppose that nothing now remained to be added to our knowledge of New Jersey forests but to fill in still more minutely the details of distribution of species and stand of timber. But all the painstaking investigations just cited are deficient in two important particulars. They do not indicate what proportion of the total forest, of the state or any of its natural or political divisions, is made up of any one species; that is to say, just how much pine, oak, chestnut, maple, etc., there is. Neither do they make any definite correlations between forests and soils; which are possible only when quantitative analyses of the forests of reasonably homogeneous areas are compared with representative analyses of soils for the same areas. The present communication, though very brief and superficial, and based on only a few days of field work, seeks to point the way to remedying these deficiencies.

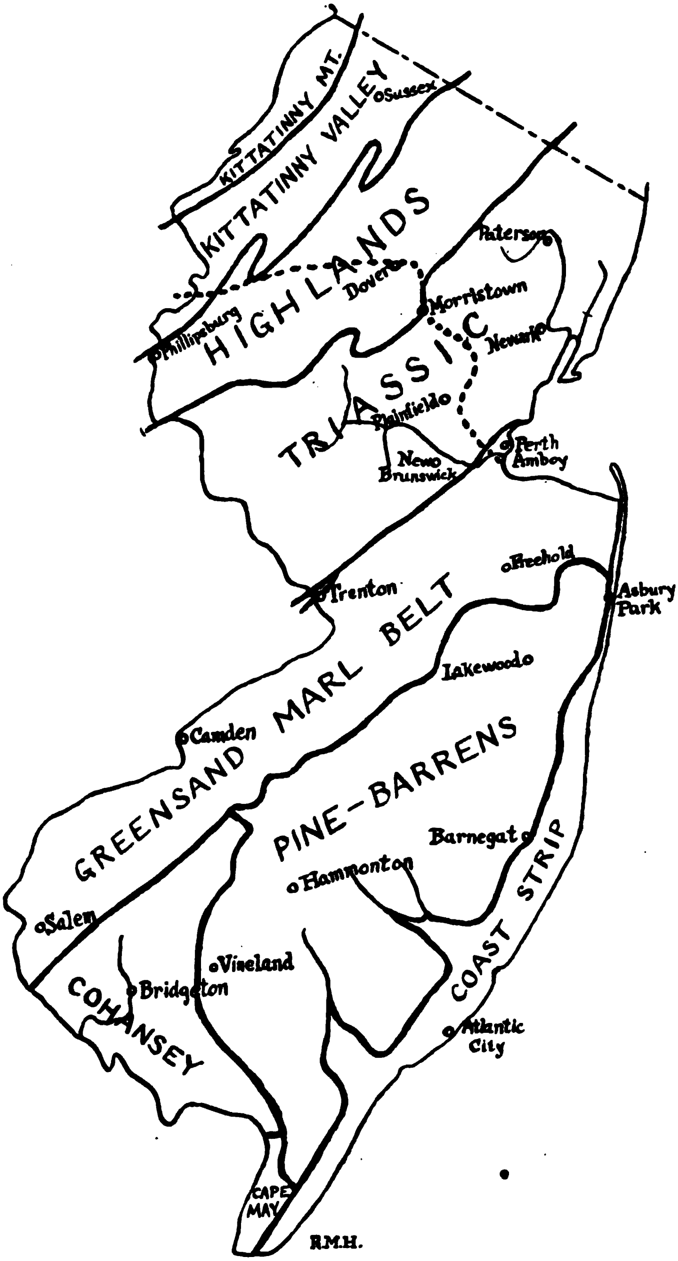
New Jersey, like most other areas of similar size, can be divided into several natural geographical divisions or forest regions, each essentially a unit, and differing from all the others in geology, topography, soil, climate, vegetation, population, agriculture, or other features. These divisions are shown on the accompanying map. As the various forest types are correlated pretty closely with soil and topography, and those with geological formations, it does not differ greatly from a geological map. With regions as small as these of course any two adjacent ones do not differ much in climate, and little attention is paid to that feature here.

Relations between Forests and Soils.—In New Jersey, as in many other temperate and moderately humid parts of the world, the com-

special feature of correlating the distribution of many of the species with geological formations, altitude, and length of growing season.

Nearly all descriptions and photographs of New Jersey vegetation hitherto published pertain to the coastal plain only, and probably more of them are the work of Dr. John W. Harshberger than of any one else. The most elaborate is his 340-page profusely illustrated book, "The Vegetation of the New Jersey Pine-barrens" (Philadelphia, 1916).

The results of investigations of the forests, made for the State Geological Survey, appeared in most of the annual reports of that office during the last decade of the nineteenth century, and culminated in the 327-page separate volume by Vermeule, Pinchot, Hollick, Gifford and others, which formed a part of the report for 1899, and was accompanied by maps showing the wooded areas in considerable detail.



Map of New Jersey showing geographical divisions. The dotted line in the northern part represents the terminal moraine or southern limit of glaciation.

position of the forests in a given area is pretty closely correlated with soil conditions. Both texture and chemical composition of the soil are significant, and we are fortunate in having considerable information about both for this state. In the last 16 years five areas in New Jersey, together covering about half the surface of the state —and parts of every geographical division except the southernmost —have been mapped and described by the U. S. Bureau of Soils. In these reports the soils are divided into several series and texture classes or types (*e. g.*, fine sand, stony loam, silty clay), and the area of each is estimated. In the regional descriptions below the principal soil classes are listed in order of area, as determined by inspection of the soil maps. Their names are self-explanatory, and it is readily understood that the clays, loams and silt loams are usually more fertile than the sands and sandy and gravelly loams.

From chemical analyses of the soil types which have been obtained from Prof. A. W. Blair, of the Agricultural Experiment Station,[2] the following table of approximate average analyses of the surface soils of six regions has been computed. Some of the minor soil constituents, whose influence on vegetation is little known, are omitted for the sake of simplicity. The soluble constituents listed are all believed to be essential to plant growth, and are generally most abundant in the best soils. In the case of the potash both the total amount and that soluble in acid are given, because soil investigators are not yet agreed as to which is the most significant. The other figures all represent total percentages.

TABLE OF AVERAGE SOIL ANALYSES FOR SIX REGIONS IN NEW JERSEY.

Regions.	Insoluble.	Potash (K_2O).		Lime (CaO).	Magnesia (MgO).	Phosphorus Pentoxide.	Nitrogen.
		Total.	Soluble.				
Kittatinny Mt., etc. ..	86.01	1.006	.235	.058	.530	.181	.157
Kittatinny Valley.....	81.09	1.785	.287	.150	.805	.161	.178
Highlands	84.23	2.395	.181	.257	.537	.152	.159
Greensand belt.......	?	1.244	?	.228	.357	.203	.084
Pine-barrens	?	0.393	?	.108	.101	.066	.053
Cohansey region......	91.46	0.783	.150	.111	.203	.068	.081

[2] See Bulletin 10 of the New Jersey Geological Survey (1913), on the "Sussex area," which covers most of the three northernmost regions, and Bulletin 309 of the Experiment Station (1916), on the "Freehold area," which takes in parts of the greensand belt and pine-barrens. The figures for the Cohansey region are based on unpublished data.

Treatment of Regional Descriptions.—For each of the geographic regions the proportion of forest remaining has been estimated, for that is evidently related to soil fertility, the more fertile soils having been cleared for agricultural purposes first,[3] and a list of the trees making up the forests is given. In the lists of trees large and small trees are separated for convenience, and both technical and common names are given, the technical names of the evergreen species being printed in heavier type.. The trees in each list are arranged in supposed order of abundance, like the soil types, the relative abundance in this case having been determined roughly in hasty reconnoissances by the writer in every county. As in the case of the soils, the data are not yet sufficiently complete to assign definite percentages to each species; but we can often be reasonably certain that a given tree is more abundant in one region than in any of the others, and where this is the case its name is preceded by a dagger in the list in which it stands highest. This not only facilitates correlations and comparisons, but should be of direct practical value to any one seeking a supply of a particular kind of timber in New Jersey.

The percentage of evergreen trees has been estimated for each region, for this is a very important factor in correlating vegetation with soils. For in coarse or poor or dry soils many of the trees cannot take up nutriment fast enough to make a complete new crop of leaves every year,[4] while in rich soils the mineral salts may accumulate so rapidly in the leaves that they have to be shed every year.

From every regional list the rarer trees are omitted, like the less extensive types of soil, for their geographical and economic significance is not sufficient to warrant devoting much space to them in a preliminary sketch. Although the species here listed together comprise only about half the number known to be native in New Jersey, they probably make up at least nine tenths of the total forest wealth.

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[3] These estimates are taken in nearly every case from C. C. Vermeule's part (page 17 and plate 3) of the 1899 forest report previously mentioned, for his work seems to have been very carefully done, and the forest area in New Jersey probably has not changed much since that time.

[4] See *Bull. Torrey Bot. Club* 40: 396–399. 1913; 41: 218–220. 1914; *Science* II. 42: 500–503. Oct. 8, 1915.

The forest statistics here given apply only to conditions in the present generation. Since the best soils have been most in demand for agricultural purposes, the kinds of trees that prefer wet, rocky or poor soils must be relatively more abundant now than they were originally; while some native trees, like the cedar and wild cherry, which flourish along roadsides, may be actually more abundant now. The usual tendency of civilization is to obliterate geographical distinctions, and if we could reconstruct the forests that the first settlers saw we would doubtless get greater contrasts between the different regions than we find today.

The Forest Regions.—1. Kittatinny Mountain is a high ridge of Silurian sandstone in the extreme northwest, extending from Delaware Water Gap northeastward into New York (where it is known as Shawangunk Mountain), and culminating at High Point, 1,804 feet above sea-level. Its southeastern slope is quite steep, but on the northwest there is a gradual descent through the Minisink Valley to the Delaware River, with the rocks becoming more shaly and the soil more fertile in that direction. For convenience the whole area between the summit and the river, about 135 square miles, nearly coextensive with the four northernmost townships along the river, will be treated as a unit.

The whole region has been glaciated, but the glacial drift is rather thin, so that the country rock is nearly everywhere in evidence. The glaciation is shown by the occurrence of several lakes, ponds and bogs as much as anything else, some of these being high up on the ridge. The entire area is covered by the soil survey of the "Sussex area" (1913), from which it appears that the prevailing classes of soil are rock outcrop (practically coextensive with the mountain, which however has considerable soil on it that deserves a better name), stony loam, loam, silt loam, gravelly loam, and fine sandy loam. The soils seem to be a little poorer than those of the somewhat similar Highlands to the eastward, particularly in lime.

According to Vermeule 64 per cent. of the area is forested. The trees average rather small, partly because of the thin rocky soil, and partly because the forests have been culled of their best trees at various times. Hardwoods predominate, but on the mountain there are some patches of pitch pine forest somewhat resembling the pine-barrens in the southern part of the state.[5] The commonest trees seem to be as follows:

(The † marks are explained on page 111.)

†*Castanea dentata,* chestnut.
†*Quercus montana,* chestnut oak.
Quercus alba, white oak.
Acer rubrum, red maple.
†*Quercus borealis maxima,* red oak.
Quercus coccinea, scarlet oak.
†**Picea Mariana,** black spruce.
Pinus Strobus, white pine.
Pinus rigida, pitch pine.
Tsuga Canadensis, hemlock.
†*Larix laricina,* tamarack.
†*Juglans cinerea,* butternut.
†*Hicoria glabra,* (pignut) hickory.
Fraxinus Americana, ash.

SMALL TREES.

Betula populifolia, gray birch.
Populus grandidentata, aspen.
Cornus florida, dogwood.

Evergreens seem to constitute about 15 per cent. of the forest.

2. The Kittatinny Valley is an integral part of the great Appalachian Valley which extends from New York to Alabama. In New Jersey it passes through Sussex and Warren Counties, and averages twelve miles wide, with a total area in the state of about 500 square miles. The rocks are Paleozoic limestones and shales, overlaid by more or less glacial drift. The prevailing soil texture classes are loam, shale loam, stony loam, gravelly loam, muck, silt loam, and sandy loam. The soils are evidently above the state average in fertility.

Agriculture (particularly dairying) has long been the leading industry here, and only 19 per cent. of the area is estimated to be wooded. The existing forest is chiefly in narrow strips along streams, and farm woodlots on rocky hills, and is doubtless nearly all second growth. The commonest trees at the present time seem to be:

Quercus alba, white oak.
†*Acer Saccharum,* sugar maple.
Juniperus Virginiana, red cedar.
Castanea dentata, chestnut.
†**Tsuga Canadensis,** hemlock.
†**Pinus Strobus,** white pine.
†*Hicoria ovata,* shagbark hickory.
Tilia Americana, linden.

SMALL TREES.

Betula populifolia, gray birch.
Ostrya Virginiana, hop hornbeam.

Evergreens are in the minority, but doubtless relatively more abundant now than originally, for the richest soils, with the largest proportion of deciduous trees, were of course cleared first.

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[5] For notes on the occurrence in this region of a number of plants more characteristic of the pine-barrens see Britton, *Bull. Torrey Club,* 11: 126–128. 1884; 14: 187–189. 1887; Dowell, *Torreya,* 7: 165–166. 1907.

3. The Highlands is an elevated area of metamorphic (mostly granitic) rocks parallel to the two preceding, almost mountainous in some places, with a maximum altitude of nearly 1,500 feet. Northeastwardly it extends to the Hudson River and beyond, and at the other end it tapers to a point near Reading, Pa., though it is the geological and physiographic analogue of the Blue Ridge, which extends from southern Pennsylvania to northern Georgia. Its area in New Jersey is about 900 square miles. It is interrupted by several comparatively straight longitudinal valleys of limestone and shale averaging about two miles wide and several hundred feet deep, and resembling the Kittatinny Valley on a small scale. In New Jersey the northern half or a little more is thinly covered with glacial drift, and contains several lakes, of which Lake Hopatcong is the largest.

The soils of the glaciated portion only are covered by the soil survey of the Sussex area, and the texture classes there are as follows, beginning with the most extensive, and excluding those making up less than 2 per cent. of the total: rough stony land, stony loam, stony sandy loam, loam, and meadow. In the chemical report the first and last named are ignored, for more or less obvious reasons, but it is evident that this region is rich in total potash, —doubtless on account of the prevalence of granitic rocks—and also in lime. In soluble potash (which is what the trees are interested in, one might say) it is inferior to the first two regions, however. The soils of the unglaciated portion have not been studied yet, but are evidently more fertile, if the extent of cultivation is any indication.[6] For Vermeule estimates the wooded area of the glaciated portion as 67 per cent. and of the unglaciated as 30 per cent.

The following list of trees is based mostly on notes taken in the glaciated portion, during a walk from Ogdensburg via Edison to Wharton on September 5, 1916. It is therefore comparable with the soil statistics given above. The differences in forest composi-

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[6] In this respect glaciation seems to have had an opposite effect on agriculture in New Jersey from what it had in Wisconsin. See Whitbeck, *Annals Assoc. Am. Geographers,* 3: 62–87. 1914.

Scene in Highlands East of Lake Hopatcong, all Wooded. September

Sand Pond (Lake Rutherford) on Kittatinny Mountain. September

Pine-barren Scene near Lakehurst. August 2, 1909.

Fields and Woods on Clayey Soil at Alloway Junction, Salem County.

tion between the two portions may be worked out later, perhaps after we have more information about the soils.

Castanea dentata, chestnut.
Quercus alba, white oak.
Quercus montana, chestnut oak.
Quercus velutina, black oak.
Acer rubrum, red maple.
Quercus borealis maxima, red oak.
†*Betula lutea,* yellow birch.
Acer Saccharum, sugar maple.
Tsuga Canadensis, hemlock.
†*Betula lenta,* cherry birch.
†*Fraxinus Americana,* ash.
Liriodendron Tulipifera, poplar.
Tilia Americana, linden.
Quercus coccinea, scarlet oak.
Hicoria alba, hickory.
Juniperus Virginiana, red cedar.
Ulmus Americana, elm.
Nyssa sylvatica, sour gum.
Juglans cinerea, butternut.
Hicoria ovata, shagbark hickory.

SMALL TREES.

Betula populifolia, gray birch.
Cornus florida, dogwood.
Populus grandidentata, aspen.

This list bears considerable resemblance to that for the Kittatinny Mountain region (which was investigated in the same way the day before). Apparently not over 10 per cent. of the trees are evergreen, a figure which goes pretty well with the high potash percentage in the soil.

4. The Triassic or red sandstone region is one of the largest in New Jersey, where it is sometimes called the Piedmont region, It extends from near Stony Point on the Hudson, in Rockland County, N. Y., southwestward to Virginia, and there are disconnected areas of the same formation in Connecticut and North Carolina. It is characterized throughout by nearly horizontal strata of shaly sandstone—which has the same characteristic reddish color all the way from Connecticut to North Carolina—and in New Jersey and northward by a number of ridges of trap rock, of which the Palisades is the most noted example. None of these ridges rise as much as 1,000 feet above sea-level. In New Jersey the northeastern half of the region is glaciated. The topography is comparatively smooth away from the trap ridges, and the streams are more subject to floods than those of other parts of the state.

The soil of the more level portions is remarkable in being of almost exactly the same color as the rock from which it is derived. It is above the average in fertility, and the greater part of the area has long been cultivated or pastured, where it is not occupied by cities and towns. The trap ridges, however, are so steep and rocky that they have generally been left in forest, except where near enough to cities to be used for residence purposes; and some of them are said to have some rather primitive inhabitants. The soil of the unglaciated portion is nearly all classed as loam in the soil survey of the "Trenton area" (1903); but if the same ground should be gone over again hereafter the soils would presumably be subdivided more. Those of the glaciated portion have not yet been mapped, but would no doubt include a considerable proportion of rock outcrop and stony loam. No chemical analyses have come to the writer's notice.

The existing forest is chiefly confined to the trap ridges and damp spots, and it covers 31 per cent. of the glaciated portion and 14 per cent. of the unglaciated, according to Vermeule. There is no way now of estimating the composition of the vast forests destroyed by the farmers in the last 250 years; but the order of abundance of the native trees at present seems to be as follows. (Both halves of the region are combined in this list.)

Quercus velutina, black oak.
Quercus alba, white oak.
Acer rubrum, red maple.
†*Quercus palustris,* pin oak.
†*Fagus grandifolia,* beech.
Juniperus Virginiana, red cedar.
†*Liriodendron Tulipifera,* poplar.
Castanea dentata, chestnut.
†*Ulmus Americana,* elm.
Hicoria alba, hickory.
Liquidambar Styraciflua, sweet gum.
Betula lenta, cherry birch.
Hicoria ovata, shagbark hickory.

SMALL TREES.

Betula populifolia, gray birch.
Cornus florida, dogwood.
†*Carpinus Caroliniana,* hornbeam.
Salix nigra, willow.

The cedar is practically the only evergreen, and it must have been scarce in the original forests, for it grows now mostly along roads and fences, which did not exist a few centuries ago. (It is used a good deal locally for Christmas trees and decorations.) The red maple and pin oak are probably relatively more abundant now than formerly, for they grow in wet places, that have been comparatively little disturbed.

The remaining divisions of the state belong to the coastal plain, and have little or no hard rock, no glacial drift except at the extreme northern corner, mostly sandy soils, and no mountains and few steep hills. The highest altitude in this part of New Jersey is less than 400 feet, and over half the area is below the 100-foot contour. On account of its rather monotonous topography it has been, and still is by some geographers, treated as a unit; but it exhibits considerable diversity in soil, and therefore in vegetation and economic features.

5. The innermost division of the coastal plain in New Jersey is the greensand marl or clay belt (corresponding with the "tension zone" of Hollick and the greater part of the "middle district" of Stone), which stretches across the state from Perth Amboy to Salem, and terminates in Maryland. The underlying strata are nearly all Cretaceous, composed largely of clay and marl with considerable greensand (a silicate of potassium), which makes pretty good soils where it comes to the surface. Many of the divides and hills, however, are capped with sand and gravel deposited at a much later period, during the so-called Pensauken submergence (of which more anon); and there are still more recent deposits at lower altitudes. The topography is undulating, but not very hilly, except in the vicinity of Atlantic Highlands (which might be treated as a distinct region if one wished to go into more detail).

The area is almost completely covered by four soil surveys, two of them rather old and two comparatively new. From these it appears that the prevailing soil texture classes are sandy loam, sand, silt loam, loam, meadow, fine sandy loam, fine sand, and loamy sand. The large proportion of silt loam (nearly 14 per cent.) indicates considerable fertility, as does the chemical analysis given in the table on page 110. If the "Freehold area" is a fair sample, this region has more phosphorus than any other of the six represented in the table, and is well supplied with lime and magnesia also. The figure for soluble potash would probably be pretty high if it was known.

Only 15 per cent. of the area was wooded in 1899, according to Vermeule, which is another sign of fertile soil. The commonest trees seem to be as follows:

†*Liquidambar Styraciflua,* sweet gum.
Quercus alba, white oak.
Castanea dentata, chestnut.
Acer rubrum, red maple.
Quercus velutina, black oak.
Quercus palustris, pin oak.
Fagus grandifolia, beech.
Liriodendron Tulipifera, poplar.
Juniperus Virginiana, red cedar.
Quercus Phellos, willow oak.
Nyssa sylvatica, sour gum.
Quercus coccinea, scarlet oak.
†*Betula nigra,* red birch.

SMALL TREES.

Betula populifolia, gray birch.
†*Salix nigra,* willow.
Cornus florida, dogwood.

Probably not more than 5 per cent. of the original forest was evergreen. The writer knows of no other area of the same size anywhere that has the sweet gum for its most abundant tree. Its prevalence here is remarkable in view of the fact that this is very near its northern limit: but it is probably correlated with the large amount of phosphorus in the soil, for the same tree has been observed in Florida to be partial to phosphatic soils.[7] It is probably relatively more abundant now than it was originally, however, for it has a marked tendency to spread in clearings, and it is not in much demand for lumber except where it grows to a large size (as in the Mississippi valley). The red maple and pin oak too have doubtless increased in relative abundance, for the same reason mentioned under the Triassic region.

6. The pine-barrens, which cover about 1,500 square miles, have been explored and written about by botanists and ecologists more than all the rest of New Jersey combined, on account of the considerable number of plants in that region that are rare or unknown elsewhere, and also because the vegetation is more nearly in a natural condition there than that in most other parts of the state. It has no exact counterpart outside of New Jersey, though there are forests of very similar aspect, but lacking most of the rare plants, on Long Island, on the Kittatinny and Shawangunk Mountains, in the moutains of Pennsylvania, and in many scattered localities from New England to western North Carolina.

The pine-barren region apparently contains no fossils, but its strata are believed to be Tertiary and later. It is not coextensive with the Tertiary area of New Jersey, however, as was once supposed, for Cape May and the country west of the Maurice River have soils and forests of a different type, which will be discussed farther on. It corresponds more nearly with an area that is supposed by geologists to have been dry land during the Pensauken submergence. This correlation, apparently first pointed out by Stone about ten years ago,[8] has been dwelt on at some length by

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[7] See 6th Ann. Rep. Fla. Geol. Surv., 277, 335, 370, 403. 1914.

[8] *Proc. Acad. Nat. Sci. Phila.*, 59: 453. 1908.

Harshberger[9] and Taylor;[10] but to the writer it appears more like an accidental coincidence without much significance.

The existing differences between the vegetation of the pine-barrens and that of the surrounding country are so obviously correlated with present soil conditions that it seems quite unnecessary to invoke geological history to explain them. Of course the fundamental cause of the soil conditions is itself largely geological; but the fertility of the greensand belt comes from its Cretaceous strata, rather than from the overlying sand and gravel deposited during Pensauken time, so that the differences between the two regions are doubtless less than they would be if there had been no Pensauken submergence!

The occurrence of a number of local species of plants in the region uuder consideration is easily accounted for by the uniqueness of the environment. These rare plants[11] are chiefly concentrated in the northeastern half of the pine-barrens, where the poorest soils in the state are located, and they are doubtless excluded from surrounding regions by differences in soil, and from somewhat similar soils at a greater distance by differences of climate.

The soil surveys of the Trenton, Freehold and Camden areas, particularly the last, published in 1917, include parts of the pine-barren region, but not the most typical parts, where there is not enough agriculture yet to justify a soil survey. From these publications it appears that the prevailing soil classes are sand, sandy loam, loamy sand, gravelly sandy loam, and fine sand. Loam, silt loam and clay, which together make up over 25 per cent. of the total in the greensand belt, are less than one half of 1 per cent. in the pine-barrens, which is a striking contrast. The chemical analyses (summarized on a preceding page) are from the north end of the region, in the "Freehold area," and may or may not represent the average fairly well. From them it is evident that the pine-barren soils are poorer in every one of the essential elements than those of the five other regions from which we have such data.

The altitude of the pine-barren region ranges from sea-level to about 300 feet, and its topography is mostly gently undulating, but is somewhat "broken" near some of the streams. As in many other sandy regions, the streams are characterized by coffee-colored water and a pretty steady flow throughout the year, and most of them are bordered by non-alluvial swamps.

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[9] Phytogeog. Surv. N. Am. 219–220, 222–223. 1911; *Torreya* 11: 219. 1911; Veg. of N. J. Pine-barrens 1–7. 1916.

[10] *Torreya* 11: 196. 1911; 12: 229–242. 1912; *Mem. N. Y. Bot. Gard.* 5: 9–25. 1915.

[11] For a list of them see Stone, Rep. N. J. State Mus. 1910: 75–78.

At least 80 per cent. of the area is still wooded, for the sterile sand offers little attraction to the average farmer.[12] However, it will produce crops when sufficiently fertilized, and the proximity of several large cities justifies a considerable expenditure in that direction, so that the cultivated area increases a little as the cities grow.

The most typical pine-barrens, that are oftenest described and photographed, are northeast of the Mullica River, in Burlington and Ocean Counties. Southwest of there the proportion of farm land and of deciduous trees in the forests gradually increases, indicating better soils, most of the characteristic rare plants disappear, and the transition to the oak country of Salem and Cumberland Counties is almost imperceptible. (Winslow Junction, for example, is always mapped as being in the pine-barrens, but the forests for miles around there give the impression of a comparatively recent growth of sprout hardwoods, with pines in the minority.) No doubt the difference of soil is due mainly to geological causes, but it is also a possibility that in the 200 years and more that the greensand belt has been cultivated the westerly winds have carried enough dust from the fields into the western part of the pine-barrens to perceptibly improve the soil and give the oaks an advantage over the pines. Another point to be considered is that the rainfall is a little heavier in the vicinity of Lakewood and Tom's River than elsewhere in southern New Jersey, and the soils thus presumably leached more there.

The general aspect of the New Jersey pine-barrens is probably familiar to most readers of the BULLETIN from personal experience or published photographs, or both. As pointed out by the writer several years ago,[13] these forests differ notably from the much more extensive southern pine-barrens in having a dense undergrowth of oak bushes, rather difficult to penetrate. Fire sweeps through some part of the area every year, but the commoner plants are used to it, and soon sprout up again from the roots. Plants sensitive to fire are chiefly confined to the immediate vicinity of swamps, where they are pretty well protected on one or more sides,[14] or to barren sandy areas where the vegetation is too sparse for a fire to traverse readily.[15]

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[12] In 1910 the percentage of "improved land in farms" in the two counties that do not extend much outside of the pine-barrens, namely, Ocean and Atlantic, was 6.08 and 9.35 respectively.

[13] *Bull. Torrey Bot. Club*, 37: 426–427. 1910.

The list of trees is a rather short one, on account of the overwhelming predominance of one species.

†**Pinus rigida**, pitch pine.
Quercus alba, white oak.
Acer rubrum, red maple.
†**Chamaecyparis thyoides**, white cedar.
Quercus velutina, black oak.
Quercus stellata, post oak.
Quercus montana, chestnut oak.
Pinus echinata, short-leaf pine.
Nyssa sylvatica, sour gum.

SMALL TREES.

†*Magnolia glauca*, sweet bay.
Quercus Marylandica, black-jack oak.
Betula populifolia, gray birch.

It seems from Pinchot's studies (published in the 1899 forest volume and earlier) that the number of pines averages about 600 to the acre, but usually less than half are of merchantable size (ten inches or more in diameter).

Something like 75 per cent. of the forest is evergreen, a condition quite different from that in other parts of the state, except the coast strip, and evidently correlated with the poverty of the soil.

7. What may be called provisionally the Cohansey region (from its principal stream) lies between the greensand belt, the pine-barrens, and Delaware Bay. It is somewhat more hilly than the pine-barrens, and the soils are evidently richer. A ferruginous sandstone conglomerate, of a type commoner in the southeastern coastal plain, crops out in a few places, and is used locally for walls and buildings. The underlying strata are Tertiary, as in the pine-barrens, but the general aspect of the country is as much like that of the Cretaceous greensand belt as the pine-barrens, and Stone combined it with the former for floristic reasons. It is sufficiently distinct from both, however.

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[14] See *Rhodora*, **18**: 201–203. 1916.

[15] See 6th Ann. Rep. Fla. Geol. Surv., 282. 1914.

The prevailing soil texture classes, according to the government soil survey of the "Salem area" (surveyed in 1901, and corrected to 1913 in Bulletin 96 of the Bureau of Soils) are silt loam, gravelly loam, sand, meadow (including marsh), sandy loam, clay and coarse sand. The abundance of silt loam (over 30 per cent.) is not easily explained, but the proximity of the Delaware River may have something to do with it. The fertile soils are not confined to the lowlands, however, for there are prosperous farms on some of the highest elevations, about 140 feet above sea-level. The chemical analyses averaged on a preceding page seem to show that the soil is intermediate in fertility between that of the two adjoining regions previously described, which is just what one would expect from the vegetation and agricultural developments.

About 30 per cent. of Cumberland County was classed as improved land in farms in 1910, so that the present forest area probably does not much exceed half the total. The woodland is rather irregularly distributed. Just south of Alloway on the road to Bridgeton, on rather sandy soil, the forest is practically unbroken for three miles, while a little farther south there are many square miles with almost no woods.

The commonest trees seem to be as follows:

Quercus alba, white oak.
†*Quercus velutina,* black oak.
Castanea dentata, chestnut.
Pinus rigida, pitch pine.
Acer rubrum, red maple.
†**Pinus echinata,** short-leaf pine.
Quercus stellata, post oak.
Quercus Marylandica, black-jack oak.
Juniperus Virginiana, red cedar.
Hicoria alba, hickory.
†**Pinus Virginiana,** scrub pine.
Liriodendron Tulipifera, poplar.

SMALL TREES.

†*Cornus florida,* dogwood.
Ilex opaca, holly.
Magnolia glauca, bay.

About 20 per cent. of the existing forest is evergreen.

8. The mainland of the Cape May peninsula has soils much like those around Bridgeton, but the topography is nearly flat. This is almost too small an area to be treated as a distinct region, but it is naturally the warmest part of New Jersey, and it is noted in botanical circles for harboring quite a number of plants that do not range

farther north. The transition to the pine-barrens on the north is gradual. Stone and Harshberger place the boundary at the Great Cedar Swamp near Dennisville, at the neck of the peninsula, but there is some pretty good pine-barren vegetation south of that, and for statistical purposes we can bring out the characteristic features of the peninsula better by drawing the line at the latitude of Cape May Court House.

Neither physical nor chemical analyses of the soils are available at present, but they are by no means sterile, for there have been farms on the Cape for 200 years. Only about 11 per cent. of the area of Cape May County was classed as improved land in 1910, but the northeastern half of the county is mostly pine-barrens and a large part is salt marsh, and if figures could be obtained for the part south of the Court House separately we would probably find that not much more than half the area under consideration is wooded. The plants of southern range are comparatively rare or inconspicuous, and the general aspect of the forests is much the same as in the Cohansey region, as shown by the following list. The trees are rather small, and no doubt most of the existing forest is second growth.

Quercus alba, white oak.
Pinus rigida, pitch pine.
Quercus velutina, black oak.
†*Quercus Phellos*, willow oak.
†*Hicoria alba*, hickory.
†*Quercus falcata*, red (or Spanish) oak.
Quercus stellata, post oak.
Acer rubrum, red maple.
Quercus Marylandica, black-jack oak.
Quercus coccinea, scarlet oak.
Liquidambar Styraciflua, sweet gum.
Nyssa sylvatica, sour gum.

SMALL TREES.

Ilex opaca, holly.
Cornus florida, dogwood.
Magnolia glauca, bay.

Something like 30 per cent. of the trees are evergreen; a higher figure than that for the Cohansey region, but much lower than in the pine-barrens.

9. From Sandy Hook to Cape May the coast is bordered by a narrow strip of sandy beaches and dunes, interrupted by occasional inlets, and separated from the mainland for most of the distance by lagoons and salt marshes averaging about four miles wide. A narrow fringe of deciduous or mixed forest between the pine-

barrens and the marshes, and extending several miles up the rivers, is also included in the coast strip by Stone.[16]

The outer beaches, moving dunes, lagoons and marshes are entirely devoid of trees, but there are or have been many small groves and scattered trees in sheltered places among stationary dunes, of about the same species as those fringing the mainland. There is practically no agriculture in the coast strip, but nearly every mile of beach is now served by railroads and occupied by summer cottages or permanent settlements (up to the size of Atlantic City),[17] so that there is not much forest left between the marshes and the ocean. The writer's observations on this strip have been rather limited, and in compiling the following list the publications of Gifford,[18] Stone[19] and Harshberger[20] have been drawn upon to a considerable extent. The commonest trees seem to be as follows:

Pinus rigida, pitch pine.
†**Juniperus Virginiana**, red cedar.
†**Ilex opaca**, holly.
Quercus stellata, post oak.
Quercus Marylandica, black-jack oak.
Quercus alba, white oak.
†*Nyssa sylvatica*, sour gum.
Acer rubrum, red maple.
Magnolia glauca, bay.

Evergreens predominate here, and this is the only region in the state where three evergreens head the list of trees, which indicates rather poor soil.

Summary.—The trees of the whole state may now be summed up in the same manner employed for separate regions. Probably every one who has traveled extensively in New Jersey realizes that the pitch pine is the most aboundant tree, but there might be many different guesses as to the second, third, fourth, etc. Only the 14 commonest large trees and four commonest small trees will be mentioned here, for beyond that the sequence is too uncertain as yet.

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[16] See *Torreya*, 12: 219. Sept., 1912. At that time the writer supposed that protection from fire was sufficient to account for this fringe of deciduous trees; but such protection alone should not make the soil richer in anything but organic matter, and therefore should not affect the percentage of evergreens, which seems to depend on available potash more than anything else.

[17] The permanent population of the coast strip has increased by leaps and bounds, from less than 1,000 in 1860 to about 90,000 in 1910. In February, 1918, the Atlantic City Chamber of Commerce estimated that the seashore resorts of New Jersey represented an investment of $200,000,000, and were visited by 21,225,000 persons annually, nearly half of whom went to Atlantic City.

[18] 1899 Report on Forests, pp. 251–252, pl. 22, 23.

[19] Rep. N. J. State Mus., 1910: 88–91, 96–98.

[20] Particularly his "Phytogeographic Survey of North America," pp. 409–420.

Pinus rigida, pitch pine.
Quercus alba, white oak.
Acer rubrum, red maple.
Quercus velutina, black oak.
Castanea dentata, chestnut.
Quercus montana, chestnut oak.
Juniperus Virginiana, red cedar.
Liquidambar Styraciflua, sweet gum.
Quercus stellata, post oak.
Quercus coccinea, scarlet oak.
Pinus echinata, short-leaf pine.
Chamaecyparis thyoides, white cedar.
Liriodendron Tulipifera, poplar.
Quercus palustris, pin oak.

Small Trees.

Betula populifolia, gray birch.
Cornus florida, dogwood.
Ilex opaca, holly.
Magnolia glauca, bay.

The most generally distributed tree is not the most abundant one, the pitch pine, but the white oak, which occurs in every one of the nine regional lists. The red maple is a close second in that respect, and both are common also in every eastern state. The percentage of evergreens is not easy to estimate, owing to the difficulty of comparing the sparse forests of the pine barrens with the denser timber of the other regions, but it is probably not far from forty.

GEOGRAPHIC FACTORS IN THE WORLD WAR.[1]

WILLIAM E. LINGELBACH.

That European geographic conditions played an important part in the origin and causes of the present war is clear. Their influence on its development even at the present moment is equally clear. Less evident but equally certain is the place the geographic factor is destined to hold in the final peace settlement. It is basic, and an appreciation of the physical and economic geography of the continent is absolutely essential to any adequate study of war and reconstruction problems. Germany's decision to violate the neutrality of Belgium and to invade France by a route eighty-five miles longer than the more direct approach to Paris from the German frontier, was dictated by the importance the German general staff placed on the topography of eastern France. Likewise a clear conception of the location and extent of the coal and iron and other mineral deposits of Europe will greatly strengthen the position of those delegated to discuss the terms of peace. All students of the war should realize that northern Serbia controlled the only routes from central Europe to the Near East, and to Saloniki, and that it was because of this, even more than because of her ambitions to build up a greater Serbia among the Western Slavs, that she was marked for destruction by the Central Powers. Germany's place in the heart of Europe, with frontiers touching seven different states, is a geographic fact that must be recognized even though we do not accept the claim set up by German military writers, that this of necessity required the maintenance of a large navy as well as an enormous army.

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[1] Readers of the BULLETIN are doubtless aware of the fact that in September the government, with the approval of most of the institutions concerned, practically took over the colleges and universities of the country, imposing on them a special course of study and of military training. This course involved, besides eleven hours of military drill and study, a course on war issues. Among the instructions issued by the War Department is a request to discuss, so far as the limits of time allowed, the general geographical background of the World War. The present article represents a lecture at the University of Pennsylvania in response to this suggestion by the writer, who appointed Director of the War Issues Course for the Third District.—Ed.

General Geographic Factors of the European Continent.

Europe is the smallest of the great continents, with a total area of between three and a half and four million square miles, that is, less than one third the size of Africa, and not quite one fifth the size of Asia, of which it is merely a small peninsula. It is a little larger than the United States, excluding Alaska, and only 25,000 square miles larger than Canada. Yet Canada has only 7,000,000 people as against Europe's 480,000,000 divided among twenty-six separate states or nations. In Europe there is an average density of population of one hundred and twenty-five persons per square mile, as against thirty-one in the United States, while in the more densely populated areas like Belgium, the density is as high as six hundred and fifty-three to the square mile.

Equally disproportionate to the size of the little continent is the large rôle it has played in history. Practically the whole of human progress during the Christian era either took place in Europe or had its roots there. After the decline of the early civilization of Asia and Africa even before the Christian era, Europe became the home of the new civilization, the seat first of Greek and Roman culture and later of medieval and modern. In more recent times, the ideals and institutions of this civilization have been carried across the seas till the whole world has been Europeanized. The two Americas are European in origin, language and institutions. The states of Africa and part of Asia are under European control, and the two great powers of the Far East—China, and Japan—have progressed in response to the promptings of the western world.

The explanation lies, in part at least, in certain geographical features and advantages possessed by the European continent, that make it particularly adapted to an advanced civilization. Of these the most important are an exceptional location; a favorable temperature and climate, and a remarkably rich and varied group of products from her soil. These affect the occupation and economic development most favorably, while the climate is of such a character that it stimulates a very high degree of energy and initiative among the people.

Europe is the only continent almost entirely within the temperate zone. It extends to 71° 11′ north, and its southernmost point reaches 36° south; that is, it is well north of the tropics and only a small portion extends into the Arctic circle. The greatest distance from east to west is 3,293 miles and from north to south 2,400 miles. Of equal importance is the fact that it lies, so to speak, in the direct current of the Gulf Stream, and is everywhere dominated by the moderating influence of the ocean. Thus there is no place on the continent outside of Russia more than 210 miles from the sea. This insures a mild and equitable climate, with plenty of rainfall; a low pressure area which in turn, stimulates a very high degree of climatic energy in the population.

Further the physical structure of the continent is unusually favorable to these influences. There are, as in the North American continent, two highland areas with a great intervening lowland area. But unlike those of the western continent, which run from north to south, the mountains of Europe run in a general easterly and westerly direction. The continent lies open completely to the prevailing westerly winds, which carry with them the moisture from the Atlantic ocean. The relief map shows the great highlands on the south extending from the Bay of Biscay to the Black Sea. The Alps are the dominant part of the system, of which the Pyrenees, the Apennines, the Carpathian Mountains and the Balkans, form the principal ranges, while the islands of the Mediterranean represent outcroppings of submerged offshoots from the principal range. The second highland region is in the northwest. It includes Finland, Sweden, Norway, Scotland and Ireland.

Between these two highland areas lies the great lowland plain extending from one end of the continent to the other. It includes England, France, Belgium, the Netherlands, Germany, Denmark and most of Russia. It is from the point of view of history one of the most important plains of the world. It is fertile in every part; there are no desert areas. Similarly in the highland areas where there are many plains and valleys like that of the Middle Danube and of the Po, the fertility is equally great. This accounts for the fact that Europe before the war produced more wheat, rye, oats, sugar and potatoes than any other continent; while its mines furnished a greater output of serviceable minerals than any other continent.

To the fertility of her soil and the wealth of her mines, Europe adds an unparalleled system of navigable rivers, harbors, and seas, which afford not only fish and other sea food in abundance, but easy means of communication and intercourse. There is scarcely a region of western Europe that has not ready access to the sea—inviting it to commercial interprise. Europe's coast line (20,000 to 40,000 miles) is considerably larger than that of Africa despite the fact that it is less than one third the size of the dark continent. The bays and gulfs are veritable seas penetrating to the heart of the continent.

This, together with the irregular surface structure of the western part of the continent, make a great number of small geographical units, affording a physical basis for the separate nationalities that have developed on this half of the continent. In eastern Europe, on the other hand, just the reverse is the case. That portion of the continent, east of the Baltic, Germany and Austria, consists of a great level plain, nowhere save on the fringe, rising to more than 1,000 feet above sea level. There are no physical boundaries for independent states, which mainly accounts for the fact that for centuries one huge country, Russia, has dominated the whole of eastern Europe, while the smaller half of the continent in the west has been divided between a score or more. Eastern Europe, moreover, is continental in other respects. Its climate is not moderated by the presence of large bodies of water or an abundance of rainfall. It is subject to great extremes of heat and cold. These are the more intense, because there are no mountain barriers to intercept the arctic air currents from the north. The same holds for the hot winds from the south and southeast in the summer, so that Petrograd is hotter in July than Madrid and in the winter south Russia is colder than London. Further Russia, before the days of the Siberian Railroad, did not lie on the road to anywhere. She was off to one side, on the edge of Europe, outside of the routes of commerce, and therefore deprived of the stimulus that comes from trade and intercourse. This with her great size and her proximity to Asia, account in large measure for the fact that Russian development up to the war had been so backward and sluggish; and that the breaking up of the old political and economic order came at a time when the war had already brought more than the usual confusion and disorganization.

REGIONAL AND NATIONAL GEOGRAPHIC FACTORS.

Other geographic factors of especial significances in the relation to the world war are so closely related to the geography of the individual countries that they are best treated in that connection, and it is to this phase of the subject that we turn next.

Great Britain's island position has beeen alluded to above. This unique geographic position among the nations of Europe has in modern times protected her against the inroads of continental wars, and guaranteed a much more uninterrupted development to her institutions and economic life than has been the case with the countries on the continent. At the same time it stimulated her commercial and colonial enterprise. She occupies a commanding strategic location with respect to the vast trade of Europe, not only because of her own position, but because of the pitch of western Europe toward the north, as a result of which the rivers flow to the North Sea and the Channel. This makes necessary the further sail past England after the sea has been reached, a voyage easily interrupted because a kind providence also put better harbors on the English side of the Channel. Little wonder that with such geographic and providential promptings, the Englishman early awoke to the true interpretation of these underlying factors in his destiny, and accepted the control of the sea as his peculiar mission. A vigorous navigation system, a powerful navy, and a far-reaching control of the key positions of the world's highways became parts of the programme. By superior statesmanship a colonial empire was slowly, but with much consistency, built up, forming a network of possessions of marvellous strategic strength. It involved control of the focal points in the open sea and of the narrows and commanding places at the entrance; the possession of India suggested a certain right of way, and Gibraltar, Malta and the Suez Canal, Aden and the Persian Gulf became corollaries to that fact.

Along with this, she developed a free trade policy about the middle of the last century which manifestly was also an outgrowth of her geographic situation. By location, by the excellence of her harbors, as well as by her abundant supply of coal, England became the natural emporium and distributing center for the world's commerce. And in contrast to the policy of Germany, she opened the ports of her vast empire to all with absolute equality of rights and opportunities.

Another fact of first-rate importance in England's economic geography is her large deposits of coal and iron lying in close proximity to each other. As a result of this she developed very early as a modern industrial state. Agriculture declined while industry and commerce grew apace, so that long before the present war, England had become very largely dependent on products from overseas for her food supply. This could only be protected in case of war by a powerful fleet, and the basis of Great Britain's navy is therefore economic and geographical even more than it is imperialistic.

France constitutes a fairly complete geographical unit with well-defined physical boundaries on all sides save on the northeast, where the frontier is an artificial line, arbitrarily drawn by history and the dictates of the balance of the power. The absence of a strong natural frontier at this point is of especial significance because over 90 per cent. of French iron ore and 50 per cent. of French coal together with about 80 per cent. of her iron and steel manufactures are located in this section. That is, the basic resources and industry of the nation lie immediately behind the weakest point in the French boundary. Successful invasion along this line by an enemy would cripple France at one blow by depriving her of those resources most needed in modern warfare. It would mean a double victory for the invaders, because it would not only deprive France of the sinews of war, but it would make them avaliable for use against her. That this situation did not escape the attention of the Germans, their dastardly strategy in the first year of the war revealed only too clearly.

But there is another feature in the geography of northern and eastern France that helped to determine the course of the Teutonic invasion in August, 1914. It is the topography of the Paris Basin with its eight natural lines of defense against a foe trying to penetrate from the east. It resembles a series of saucers set one in the other with the largest at the bottom and the smallest at the top. Paris lies in the center of the depression and the geological strata all rise gently toward the east, forming escarpments where the edge crops out above the surface of the ground. These naturally face eastward and are easily defended. The few breaks made by rivers like the Moselle or the tributaries of the Seine are too narrow and tortuous to permit the advance and deploying of modern armies with accessories. To invade France by the direct route was from the military standpoint impracticable; impracticable unless, as in 1870, the armies entrusted with the protection of the defenses were first captured. Fortunately the French forces of 1914 were not so easily disposed of, notwithstanding the fact that they were foully hit below the belt at the very beginning with just this end in view. Unable to invade France by the direct route, Germany broke her pledge to the nations, crossed Luxemburg and Belgium, and drove her armies along the level coastal plain almost to the gates of Paris unhindered by natural obstacles, and delayed by only such military resistance as could be hurriedly rushed to the scene. Had Joffre failed at the Marne, the world would have seen a repetition on a colossal scale of the battles west of Metz in 1870. The prize would have been the whole French army on the eastern front, fighting an enemy which had, by violating its most solemn pledges, gotten in behind the natural defenses of France. For relying on the treaties guaranteeing Belgian neutrality, France had not made adequate defensive preparation in that quarter.

Belgian neutrality in its turn is a product of the geography of the country. Belgium lies at the cross roads of international intercourse in northwestern Europe. It is, so to speak, the focal point for the hostile political aspirations of France, England, Germany and Holland. For centuries it has been the cockpit of Europe! Controlled successively by Spain, Austria and France, it was in 1815 united to Holland to form a strong buffer state against France. By 1830 the national spirit had grown so strong that it was successful in a revolt against the Dutch, and the Belgians won their independence. The powers, Great Britain, France, Prussia, Russia and Austria, pledged themselves to guarantee and respect her neutrality.

Since then, Belgium prospered greatly, till it had become one of the most highly developed and progressive countries in the world before the war. Nowhere else is there so well-balanced a prosperity. Added to an unusually fertile soil, extensive mineral resources and great variety of manufactures, is a highly developed system of trade communications both by land and water. On the other hand, Belgian agriculture, although practised on an intensive scale, has for many years been inadequate for the needs of the population, and great quantities of foodstuffs had to be imported. In return Belgium exported not only her coal and iron products but a great variety of manufactured articles made by her people from materials imported either in the raw or partly finished state from abroad.

In commerce Belgium ranked very high—fifth among the nations in spite of her small size. Antwerp, through which most of this trade passed, is geographically remarkably well located to be one of the three greatest of the world's commercial centers. Indeed it had already attained that rank before the war, its net tonnage in 1913 actaully far surpassing that of Hamburg and Roterdam and ranking with New York. It is located at a point on the Scheldt where the river is sufficiently deep to accommodate vessels of the largest ocean-going type. All of Belgium and some of the richest industrial areas of France and Germany are in part at least tributary to it.

Belgium is inhabited by Flemish and Walloons, the Flemish, number about three and a half millions and are closely akin to the Dutch in language and customs. In religion on the other hand they differ from the Protestant Dutch, adhering like their fellow citizens, the Belgians of the southern and hilly part of the country, to the Roman Catholic faith. The latter are known as Walloons and number about three million. They speak French and like the French have been inclined to free-thinking. But the Belgians like the Swiss may differ as to many important matters including language and race, yet there has developed among them a patriotism stronger than these, which knits them firmly into a nation.

Geographically, Holland or the Netherlands, differ very little from the Flemish part of Belgium. It has no natural boundaries. Its frontiers on the land side are the result of historic and not of topographical causes. In contrast to Belgium it is agricultural and commercial rather than industrial. Its control of the mouths of the Rhine and of the Meuse with the fine port of Rotterdam afford unusual facilities for commerce. From the standpoint of the larger international situation the geography of Holland is such that control of Belgium by Germany would turn Holland into an absolute dependency of the German Empire.

Among the geographic features of Germany a few merit special mention. First is her central position and the fact that practically all the rivers flowing from the central highlands to the North and Baltic Seas pass through Germany, affording not only good harbors like Bremen and Hamburg, but excellent means of inland transportation. There are large coal and iron deposits in the Westphalian district, which, with the iron ore of Lorraine, have given her a marked ascendancy in iron industry over other European countries. As to boundaries, northern Germany illustrates the characteristics of the coastal plain, which of course has no physical boundaries save to the north. This is especially conspicuous in the east, where the absence of natural barriers has led to frequent struggles between Teuton and Slav in an effort to stake out a frontier left undefined by nature. In the northwest too, physical boundaries are lacking. This added to the fact that Germany occupies so central a position in Europe, has been an extremely important factor in the history of the German people. Unlike the French, the Germans did not become united under a strong central monarch in the fifteenth century. Instead they remained divided for centuries and were only loosely united into the so-called Holy Roman Empire till Napoleon finally disrupted this confederation by destroying the political identity of several hundred petty states. Out of this there came in 1815 a confederation of thirty-seven states, each sovereign and exercising its sovereign rights with extreme jealousy. Indeed till the formation of the German Empire mutual distrust and frequent wars marked the life of the states of the Confederation. Unification itself was the result of Bismarck's policy of "blood and iron" in three successive wars, and the expulsion of the German Austrians.

The political boundary of the German Empire is therefore very far from articulating with racial and language frontiers. In Alsace-Lorraine, in Schleswig and in Poland it encroaches on its neighbors while on the Austrian front it falls short. On the Baltic front too Pan-Germans would have us believe that the political boundary should be pushed out. Ignoring the fact that the highest estimate of the German-speaking elements in the Baltic provinces does not allow them more than 10 per cent. of the total population, they nevertheless urge the complete absorption of the region. The three provinces of Courland, Livonia and Esthonia stretching in a narrow strip from Prussia to Finland, form, it is claimed, a geographical unit with the Baltic, very definitely separated from the Russian plain by lakes, marshes and a belt of hill country. The extent to which geography has been a factor in maintaining till now the autocratic system may be best seen in the arguments advanced by the champions of Prussianism.

Some of the main features of the geography of European Russia have been alluded to above. Its continental character, its climate of extremes of temperature, the monotonous uniformity of the great Russian plain, the absence of adequate outlets to the routes of commerce, its proximity to Asia are all obvious and well known. Less so are the peculiar deficiencies of the pre-war boundaries on the southwest. Austria had pushed beyond the Carpathians which would form a natural frontier. Between the Black Sea and the mountains there is an open gateway to the Roumanian plain and the lower Danube, while the Black Sea constitutes an even more inviting avenue of approach to Constantinople and the Mediterranean.

The importance of this cannot be too much emphasized, because nearly all the vast economic area of European Russia drains southward, forming the great Black Sea basin. It is true that the largest of the rivers, the Volga flows into the Caspian, but in its lower course it approaches so near the Don that a short canal would bring it into the system. Furthermore a canal already projected before the war was to connect western Siberia with the Volga Basin, giving water transportation to Siberia's food supplies to central and south Russia. This would focus at the mouth of the Don an inland commerce, if not the richest of the world at present, decidedly so in potential wealth, and similar in some respect to that of Chicago.

The immense wealth of the Dnieper, Dniester, Don and Volga valleys and of the Caspian basin in food-stuffs, timber, minerals and oil would supplement in an altogether exceptional way the extensive deposits of coal and iron found in close juxtaposition on the lower Donetz, the wheat of the best of the black earth belt and the hides and live stock of the grazing lands of southern Russia. Since the Russian Revolution, the creation of a separate Ukranian state has cut squarely across the southern and middle area of this region, extending itself to include the Donetz, despite the fact that on the basis of language and race the delimitations of the new state would fall far short of the lower Don. The evidence of Pan-German appreciation of the value of giving attention to economic geography in treaty making is only too apparent.

Approximately two thirds of the wealth and resources of European Russia—and it is enormous—has its natural outlet to the outside world through the Bosphorus. The meaning of this, when combined with social and religious affinity for the Slavs of the Balkans, the history of Russia has shown repeatedly. That it will re-appear with steadily increasing power and in direct ratio to the progress of Russia's economic development is evident. One hundred and twenty-five million Russians occupying one of the regions of the world's greatest economic possibilities will not, in the future, be easily denied a free outlet at Constantinople even if they have for the time being lost sight of their nationalistic hopes and ambitions.

From the point of view of the war, moreover, the fact that Russia was still an agricultural state, complementary to the industrial areas of western Europe, made her peculiarly susceptible to the closing of Constantinople and the straits in the first year of the war.

Of the geography of the Balkans it has been properly said that the peninsula turns its back on Europe and looks toward Asia inviting invasion. While communication and intercourse with Asia are open and easy, access to central Europe is over difficult territory. The Turkish conquest of the Christian peoples, mostly Slavs, was easily accomplished, and with such geographical conditions it was able to maintain itself for nearly 500 years. European powers like Great Britain and Russia were interested in the Balkans less for economic than for international and political reasons. With the advent of the railroad, however, and the opening of the line to Constantinople the attention of Europe was attracted to the remarkable economic and commercial possibilities of the Balkans. Before the days of the railroad and for some time after, the Balkans were, so to speak, isolated from the rest of Europe. Their political development reflect this geographical situation until the advent of the railroad when the recognition of the very large economic possibilities of this area shifted the center of European interest at once to this region.

Thus Germany's interests in the Near East in 1878 were not worth, according to Bismarck's estimate, the bones of a dead Pomeranian grenadier. Today, just forty years later, she is in the fourth year of a world struggle which began, in large part, over the aggressive extension of her ambitious projects at Constantinople. The development of modern transportation has quickly lifted the Balkan Peninsula to a position of tremendous economic and strategic importance. It is no longer at the back door of Europe but the most important highway of communication with Near- and Further-Asia. Its long-neglected valleys, cities and harbors are today regarded in the light of potential development. Thus Salonica has not as yet been of any great importance commercially, but the economic strategists of Central Europe, especially of Germany, more than twenty years ago, saw in it the great emporium for the trade of that region with the east. The manufactures of the great industrial area of central Europe can be carried by gravity down the Danube to Belgrade; thence they can be sent up the Morava to a point where its topography would necessitate land transportation over the divide to the waters of the Vardar, whence they would again be carried by gravity to Salonica. The saving in distance over the route by the ports of the North Sea would be many hundred miles, not to mention an equal saving in time and cost.

Of even greater significance is the trade route via Constntinople. For it is destined to be the focal point not only of the great trade between Europe and western Asia with its great mineral and agricultural possibilities, but, as I have shown, of that between Russia and the Mediterranean trade as well.

In view of this, we must not forget that the only direct channels through which the trade between western and central Europe and southwestern Europe can pass are the Danube or the narrow north-south trench of the Morava to Nish, thence by a secondary trench eastward to Constantinople along the Maritza. It is along this line that the artery was laid which fed Turkey's army and kept Bulgaria in line with the Central Powers, when Serbia, which controlled both the trench and the Danube, was crushed through the defection of Bulgaria. That the topography of the Balkans and the peculiar location of the peninsula will be of the utmost importance in the European development after the war is evident.

From the Adriatic, the Balkans are almost inaccessible, because of the broad belt of mountains between the Morava-Vardar depression which terminate here in the rugged Dalmatian Alps. These, save for the very narrow strip along the Dalmatian coast, end abruptly at the water's edge. At a few points only, is this so-called backbone of the peninsula broken by streams and gorge-like valleys. Of these the Narenta, the Drin, and he Shkumbi are of some importance. The last is the valley along which the famous Roman road, the Via Eugnatia, followed. This valley affords the means of communication between Durazzo and Monastir, but the fact that it has to cross three mountain passes is an indication of the rugged and impractical character of the route. None of the routes have been made available for commerce or military operations on anything but the smallest scale.

The peculiarity of the western Balkan highland is naturally of considerable importance in relation to the ambition of Italy in this region. The fine harbors at Durazzo and Valona are by nature cut off from the hinterland, and Italians look upon them with longing eyes not only because they constitute an integral part of the Adriatic basin, but because Italian harbors on the Adriatic suffer from shallow water caused by the slow emergence of the coast.

Of large national significance in connection with the geography of Italy in the war, is the exposed position of Italian ports and cities to attack from the sea, the lack of coal and raw mtaerials and with the proximity of northern Italy to the industrial area of central Europe north of the Alps. I say proximity because of the rôle played by the Alpine tunnels as trade factors. This, together with the absence of coal, made Italy peculiarly susceptible to German commercial methods—penetration, dumping, etc. Finally Italy's unique position in the Mediterranean combined with the revival of the commercial importance of that sea by the Suez Canal should be noted. The leader of the world in civilization to the end of the Renaissance, Italy fell into decay because the Mediterranean became an inland lake. The Suez Canal made it again a great trade route. Italy, or more definitely Naples, may, in a sense, be considered one of the world's commercial hubs, destined to increase steadily in importance as the great current of trade increases and the economic importance of northern Africa is developed. Italian ambitions in the Adriatic, the Balkans and the eastern Mediterranean as in the Trentino are fostered by geography, and require serious consideration at the future peace conference.

Geographically, Austria-Hungary has no greater unity than it has socially or linguistically. To be noted in a sketch like this is the importance of the Danube as the axis of the region. Connecting central Europe with the Near East, it is the great historic highway along which nations have advanced and retreated. Its remarkable basin with its rich resources in agriculture, minerals and forests, has been for centuries a cause of conflict between rival governments and peoples. The Teutons came first as the Roman defences weakened. They pushed up the Danube, passing Vienna (then Vindabona). In their wake came the great forward movement of Slavic peoples occupying the middle and lower Danube valley and pushing on to the Adriatic. Into this mass of Slavs two wedges were driven, one by the Germans from the northwest, the other by the Hungarians. The Slavs were driven back from the river to the hilly country from which there has been a steady pressure on their part to get down to the richer lands of the river valley. The hill country itself is divided into separate units like the Bohemian plateau, the home and cradle of the Czecho-Slovak nation.

The acute geographical problems of the peace congress will be many. In addition to those discussed above there is space only to refer to one or two. The boundaries of the new Czecho-Slovak state will be difficult to draw, as also will be those of the sister Slav state of the Jugo-Slavs in the southwest. Each of these confederations of Slavic people will have, it is estimated, a population of about ten million people. Of these, the Czecho-Slovaks will be landlocked. This will inevitably lead to the adoption of the principle of free outlets to the sea. If Poland is to become a kingdom that shall endure, it must be given the lower Vistula outlet and Dantzig.

These are very simple problems of the larger questions of trade outlets, the internationalizing of essential waterways and of the economic as well as the geographic unity of areas heretofore separated and divided. Plainly the nearer the approach to an articulation between political and language frontiers on the one hand and the geographical on the other, the more in accord with nature, and therefore the more enduring will be the territorial arrangements made after the war.

BOOK REVIEWS.

von Schierbrand Wolf. *Austria-Hungary: the Polyglot Empire.* Pp. vii, 352. Price, $3.00. New York, Frederick A. Stokes Company, 1917.

Dr. von Schierbrand was in Austria from 1912 to 1916, thus having ample time to see the Dual Monarchy both at peace and at war. While disclaiming the production of another "war book," the author nevertheless and necessarily touches upon war topics, especially near the end where he discussed refugee camps, visits to war prisoners, and so on. For the most part, however, the work is a descriptive interpretation of the forces at work in this many-sided country. The historical background is given in the opening chapters, showing how the "polygot empire" came to be; the racial question, with its disrupting tendencies, is adequately presented; the political and social life of the country outlined. Of special interest at the present time is the chapter on economic troubles and their remedy. The generally undeveloped condition of agriculture and the prevailing inefficiency of industrial life as described by the author is in strong contrast with the conditions prevailing in Germany. In fact, we are told that, with a few notable exceptions, German initiative, German managers, German methods, and, to a large degree, German capital, are principally responsible for what modern economic progress Austria-Hungary has made. As for the future, the author concludes Austria-Hungary must come, in increasing measure, under the sway of Germany, in political as well as in economic life, unless liberal forces win out, and the many nationalities in the polygot empire be given freedom to work out their own life by the establishment of something analogous to a United States of Austria-Hungary.

Faris, John T. *Old Roads out of Philadelphia.* Pp. 326, profusely illustrated, map. Philadelphia, J. B. Lippincott Co. 1917. Price, $4.00.

In this extremely interesting, if somewhat miscellaneous, volume, Mr. Faris, a member of the City History Society of Philadelphia and the Historical Society of Pennsylvania, tells of the ten old roads which radiate from Philadelphia, covering half the points of the compass. The King's Highway to Wilmington, the Baltimore, West Chester and Lancaster turnpikes, the Gulph Road, the Ridge Road, the Old York Road, the Bethlehem road, that to Bristol and Trenton, and the road to Reading, which the author describes under a much more limited title as the "Old Germantown Road," are all passed in review, and the result is a charming book which should not be read at one sitting, but should be kept at hand to dip into and to use for reference.

The author disclaims any attempt to make the work exhaustive. Persons familiar with any special highway which Mr. Faris has treated will doubtless find many points omitted; but the story of each road, treated with an approach to completeness, would form a volume of considerable size. Almost every other history of the roads leading from Philadelphia has lacked interest because of the historian's endeavor to include matters of mere genealogical detail and of narrowly local application. Mr. Faris has wisely selected his material so as to make an account that is much above the average in interest and value.

"Old Roads out of Philadelphia" is an important contribution to the body of literature which is slowly rendering Philadelphians aware of the treasures of tradition, of reminiscence and of history which have their physical basis in the city and its surroundings. The beautiful Piedmont country lying west of the Delaware will have its charm enhanced by this book, which is better than a novel because it cannot be exhausted in one reading. One disposed to push his investigations deeper might wish that the bibliography had been more extensive and better classified, but even to note such a minor blemish seems ungracious in veiw of the general excellence of the work.

WALTER LEFFERTS.

Description of and Guide to Jasper Park.[1] Ottawa, Department of the Interior, 1917. Pp. 97.

Despite the split prepositions of the title, this attractive publication is of real interest and of permanent value.

"Jasper park is historic ground," is the appropriate opening sentence of the book; for the park lies in a belt of territory that was the scene of much strenuous living and high adventuring in days that may well be styled the Epic Period of our continent's development. The excellent sketch of the events staged in the park in those distant days is, *par excellence,* the feature of the volume. It awakens the keen interest of the reader, and will attract to the park many a tourist and investigator. "Jasper park has a literature of its own," we again read; and it is a thrilling literature. How unfortunate that a complete bibliography of this literature was not included. It would greatly enhance the interest and value of the publication, and might even yet be prepared as an insert.

The descriptive portion of the book is adequate according to its purpose. It was not meant for literature in the high sense. The guide-book chapters are well compiled, so far as refers to the shorter trips from Jasper and Pocahontas. But when we read in the appendix the estimated time required for these trips, we realize that they are outlined for the tourist and not for the traveler who really desires to do serious work and spend weeks in the saddle amid the joys of the real wilderness. Yet perhaps that is as it should be. The tourist loves to have his thinking done for him the traveler does his own. The guide book of the wilderness traveler is the compass and the stars, his itinerary is regulated by the ranges and the rivers; his mentors are the Red Gods.

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[1] Obtained through membership in the Associated Mountaineering Clubs of North America.

It is a pity that the map is so limited in its scope: even such notable physical fetaures of the park as Maligne Lake and the Miette Hot Springs are beyond the area covered by it. Good maps of the entire park exist. Why was not one of them reproduced?

The book is beautifully made, as befits a government publication. The photographs are magnificent, and bear a special appeal to those who have seen the grandeur and beauty that they reproduce. Of unique interest are those by Horetzsky. We who go into the wild with dry plate and film can have no conception of the labor of love involved in photography in earlier days when the plate had to be made and developed on the spot. The official photographs of the Survey are grand, striking, utilitarian; necessarily with little attention paid to composition. But for sheer and esthetic appeal Topley's are supreme, and well reflect the gentle spirit, the artist's vision, the personal charm, of one of the most delightful of wilderness lovers.

B. W. Mitchell.

Bell, Archie. *Sunset Canada (British Columbia and Beyond).*[1] Boston, The Page Company. Price, $3.50 net.

This book is a comprehensive and interesting account of the history of the colonization and development of the far northwest and has many illustrations, some in color, and a map adds value to the text. The author is an enthusiast and dwells largely on the scenic beauty of the country and gives practical details for the enjoyment of the visitor, either as tourist, sportsman or agriculturist.

The book is thoroughly up-to-date, containing information on every point for which it may be consulted and the perusal of it could scarcely fail to induce those who are not already familiar with this part of the world to immediately make acquaintance with the cities, lakes, glaciers and magnificent mountains of British Columbia.

L. B.

GEOGRAPHIC NEWS AND NOTES.

Life on the Piedmont and the Coastal Plain in the Philadelphia District.—Philadelphia lies on the boundary line between the Coastal Plain and the Piedmont. The physiographic difference between the rolling uplands to the north and west of the city and the lowlands to the south and east is reflected strongly in differences in animal and plant life. These differences are set forth with much interest in a recent contribution by Dr. Spencer Trotter in Volume VIII of the Transactions of the Wagner Free Institute, entitled "The Life Features of the Coastal Plain and the Piedmont."

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[1] Obtained through membership in the Associated Mountaineering Clubs of North America.

The Coastal Plain to the south and east of Philadelphia is characterized, according to Dr. Trotter, by a decidedly "Carolinian" or southern type of fauna, while to the north and west the "Alleghanian" or transition-zone species dominate. For example, the Worm-eating Warbler, a typical bird species, is much more abundant in the woodlands of the southern section of the Philadelphia district than it is in the northern portion. Likewise the Blue-winged Yellow Warbler, the Kentucky Warbler, the Carolina Wren, the Carolina Chickadee, the Tufted Titmouse, the Yellow-breasted Chat, the Acadian Flycatcher, the Cardinal Grosbeak, the Barn Owl, and the Turkey Buzzard are all more abundant on the coastal plain side of the Philadelphia District than in the hill country to the west. Among mammals, the Gray Fox and the Opossum are characteristic southern species much more numerous on the Coastal Plain. The distribution of certain reptiles in like manner indicates this region of the lower Delaware Valley to be more or less a district faunal boundary. The Box Turtle is a characteristic southern type, as is the Ground Lizard, the Swift Lizard, the Diamond-back Terrapin, the Red-bellied Terrapin, Muhlenberg's Tortoise, the Corn and Chain snakes, the Water-snake, the Pine snake and the Copperhead.

What determines this difference in the distribution of animal forms in the locality about Philadelphia? According to the author, temperature cannot be regarded as the controlling factor. The difference, he believes, lies in the character of the vegetation, and this in turn lies in the differences in geologic structure and geologic history. The northern hardwood forest, with its beeches, birches, maples, elms and other hardwoods reaches its southern confines in the Piedmont. In the district immediately south of Philadelphia the more southern type of woodland prevails, a forest of rich and deep alluvial soils remarkable for its great variety of trees,—many kinds of oaks, hickory, the buckeyes, the chestnut, ash, and, especially characteristic, the sweetgum, the willow oak, the pepper bush and the swamp magnolia. It is with this particular type of woodland that the Carolinian fauna is associated. The "Pine barrens" on the New Jersey sands harbors certain characteristic species of birds. Thus the Prairie Warbler is almost entirely absent during the breeding season on the western side of the Delaware, where the alluvial type of woodland prevails. Conversely, the Worm-eating Warbler is never found in Pine Barren district on the New Jersey side. Thus we have near Philadelphia, the southern limits of the northern hardwood forests, the northern limits of the southern pines are found in the Pine Barrens of New Jersey, and the transition zone of southern hardwoods in the alluvial soils of the inner parts of the coastal plain. "In Colonial days a line run by the English surveyors, Mason and Dixon, arbitrarily fixed a boundary that in after-years made a "North" and a "South." The real physical and biological "South" however, as we now know it, reaches to the fall-line of the lower Delaware, and the city of Philadelphia touches the edge of "Dixie-land." One with an eye for the country side realizes this—the clear whistle of the Cardinal and the loud chant of the Carolina wren betoken it, as well does the lazily soaring Turkey Buzzard, the strange Barn Owl, the casual

Opossum, the groves of Sweet Gum trees and other no less characteristic features. To be sure, these sometimes are seen beyond the fall-line, but never so abundantly as on the Coastal Plain to the south."

The Development of Brazil's Iron Resources.—One of the very largest deposits of iron ore known is in the mountains of eastern Brazil. With all these riches, however, Brazil has been keenly suffering during the war from a lack of iron and steel for essential needs. The war has emphasized the need of developing these ore deposits as a source of wealth for Brazil. An account of these deposits taken from *O Jornal do Commercio* of Rio de Janeiro appeared in the April *Americas.* The iron ore fields are in the State of Minas Geraes, 350 kilometers north of Rio de Janeiro, in an area 500 kilometers long by 50 wide. Sixty deposits of high grade hematite are known to exist in this area. The chief handicaps to the development of these great deposits have been transportation and fuel. Railroads, however, were being pushed through from the coast to the iron fields when the outbreak of the war halted operations. One railroad already serves the region and others can soon be extended to connect it with the coast. The lack of coal in Brazil is a second serious handicap. Without coal, it would seem that an iron industry would not be possible. Plans are under way, however, to develop both the mining of iron ore and the growth of an iron industry in Brazil. Big mining companies have already laid their plans for post war work. Railroad and dock facilities, and the construction of ore-carrying boats will make Brazilian ore readily available for Europe and the United States and we may expect to see large cargoes of ore coming to American and European ports soon after the war. Returning ore boats, on the other hand, can cheaply bring coal back to Brazil as a return or ballast cargo, and cheap coal will make possible the growth of a local iron industry, possibly of much importance in supplying Brazil's growing demands for iron and steel. It is expected that the development of a Brazilian steel industry will be analogous to the development of the steel industry on the upper Great Lakes, where returning ore boats to Superior bring back cheap coal from Lake Erie ports. Brazil is sure to be greatly benefited by these important iron deposits, both commercially and industrially.

Imports from Asia.—In the last fiscal year (1917–18), our imports from Asia and Oceania exceeded those from any of the other four great divisions of the world. For the year, the value of imports from this source was $972,803,349. The importance of Asia as a source of raw materials is constantly growing. The following table gives the leading imports from the five counties leading in imports into the United States and indicates the significant raw material character of the big commodities coming from the Orient.

From	Amount.
British E. Indies (total)	$296,606,132
Rubber	138,324,996

Jute cloth and bagging	52,705,948
Goatskins	19,997,770
Tea	10,294,599
Japan (total)	284,945,439
Silk	152,129,401
Tea	9,511,283
Soya beans	8,255,001
Etc.	
China (total)	158,863,617
Silk	28,668,263
Soya beans	24,560,656
Goatskins	7,469,817
Cattlehides	4,119,451
Raw cotton	5,304,448
Tea	4,361,599
Etc.	
Dutch East Indies	79,718,223
Rubber	30,504,525
Philippines	78,101,412
Manila hemp	30,434,825
Sugar	7,913,240
Cigars and cheroots	4,478,852

Stefansson Returns.—On September 17, Vilhjalmur Stefansson landed at Vancouver, B. C., after a long and eventful period in the far north. The newspapers report Stefansson as saying that his party did everything it set out to do. "We did not discover a continent northwest of Prince Patrick Land, as reported," he asserted. "We did find several new islands. We mapped and explored these new lands; we made scientific explorations of the country around Coronation Gulf; we studied the Eskimos, the plants, the animals, and mapped the ocean currents and channels." One of the islands is about the size of Ireland, the explorer said. The British flag was raised June 19, 1915, on this land, which is in what was formerly called the Gustav Adolph Sea.

Stefansson confirmed the report that copper and coal were found by him in the north. "We found coal on nearly every island we touched," he said. "These coal lands may some day be of great value, for it was only a few years ago that the Spitzbergen Islands, in the Arctic north of the Atlantic, were little thought of as coal producers. Now the Spitzbergen Islands, farther north than many islands on which we found coal, rival Wales in coal production."

Division of France into Economic Regions.—The division of France into economic regions, in order to insure the most effective coöperation of French chambers of commerce in the solution of after-the-war economic problems, is the task upon which the French Ministry of Commerce is at present busily engaged, according to Commerce Reports of September 30. These economic problems will be numerous and complex. Among the most pressing will be the industrial reconstruction of the invaded regions, the coördination of existing railway lines, the maximum utilization of hydroelectric power, the improvement of French sea ports, and the development of the interior waterways of the country. To solve these questions the coöperation of the chambers of commerce will be essential. The Ministry of Commerce believes that in this and many similar problems the necessary coöperation can not be realized on the basis of the existing departmental frontiers. To eliminate this barrier to successful coöperation among the chambers of commerce of certain regions, the Ministry of Commerce proposes to divide all of France into sixteen economic regions, without regard to departmental limits where they do not conform to economic zones of influence. For example, the influence of the city of Lyon extends over all of the departments of Ain, Rhone, Loire, Ardeche, and Drome, but over only a part of the departments of Saone-et-Loire, Haute-Loire, and Isere. The economic region of which Lyon is the unchallenged capital must be defined by other than departmental frontiers. Similar adjudications are called for in the case of other important urban centers. However, the Ministry of Commerce believes that the sixteen regions which have been submitted to the chambers of commerce for their approval represent the most logical division of the country from the economic standpoint and that these divisions will constitute a framework within which the changes which the war has imposed upon France can be most effectively planned and carried into execution.

Lieut.-Colonel Theodore LeBoutillier, M.C., for many years recording secretary of our Society, is now Chief of Medical Service at Base Hospital 57, in Paris.

ACTIVITIES OF THE SOCIETY.

VILHJALMUR STEFANSSON.

The opening lecture of the season was given by V. Stefansson, under the auspices of the Society, at the Academy of Music on Wednesday evening, November 6. The explorer related incidents of his five-year sojourn in the Arctic, and described how he and his companions had subsisted off the country in comparative comfort for over a year, while his friends in the south believed he had perished. The new islands discovered north of Prince Patrick Island were described, and the scientific results of the Canadian Arctic Expedition were summarized.

Many striking views of native life and Arctic sledge travel illustrated the address.

FRANCE AS REVEALED BY HER SCENERY AND PEOPLES.

BY PROFESSOR EMANUEL DE MARTONNE.

Owing to the presence in this country as a member of the French Educational Mission to the United States of Professor Emanuel de Martonne, arrangements were made to secure an address by the distinguished French geographer on the above topic on the evening of November 21. Inviting his hearers to visit with him typical sections of the central plateau, and of Brittany and of Champagne, the speaker dwelt on the sharp contrasts in topography, the varied industries and racial stocks exhibited in the different provinces, which, however, formed a homogeneous nation which nobly responded to the ordeal of a devastating war. The address was appropriately illustrated with maps and lantern views. On the afternoon preceding the lecture, members were invited to meet Professor de Martonne at a reception tendered to him at the rooms of the Society from four until half past five o'clock.

EXCURSIONS.

BIRD WALK.

Bird lovers availed themselves of the opportunity to join in a "Bird Walk" on Friday afternoon, May 24. Seventy-five members assembled at the Sixty-ninth Street Terminal at 5 P.M., and took a special car to Broomall station. From thence, the party was conducted on a two-mile walk through the neighboring woodlands by the leader, Mr. Samuel Scovill, Jr., whose familiarity with the bird life of the region enabled him to identify with unerring accuracy many feathered songsters vocal at that hour of the day. After partaking of an al-fresco supper, the excursionists boarded the trolley at Bromall and arrived back in the city about eight o'clock.

ITALIAN GARDENS OF MR. AND MRS. ALBA B. JOHNSON.

Renewing a courtesy extended some years ago, Mr. and Mrs. Alba B. Johnson invited members of the Society to visit, on June 15 last, the Italian Gardens on their estate—Castañia—on the Montgomery Pike about one and a half miles from Rosemont station. Some 100 members enjoyed the rare privilege of inspecting the lovely grounds, which appeared at their best in mid-June. Competent volunteer guides conducted the guests about the grounds and ideal weather conditions and the note of personal hospitality present, made this one of the most successful outings of the Society in recent years.

ACCESSIONS TO THE LIBRARY.

Dixon, Royal. *The Human Side of Animals.*[1] Pp. 252. Illustrated. New York, Frederick A. Stokes Company. 1918. Price, $1.75 net.

Sweetser, M. F. *A Guide to the White Mountains.*[1] Pp. 387. Illustrated. Boston, Houghton, Mifflin Co. 1918. With maps. Pocket Size. $2.75 net.

St. John, Larry. *Practical Bait Casting.*[1] Pp. 181. Illustrated. New York, Macmillan Co. Price, $1.00.

Allen, Edward Frank. *A Guide to the National Parks of America.*[1] Pp. 338. Illustrated with maps. New York, Robert M. McBride & Co. 1918. Price, $1.25 net, postage extra.

Saunders, Charles Francis. *Finding the Worth While in the Southwest.*[1] Pp. 231. Illustrated. New York, Robert M. McBride & Co. 1918. Price, $1.25 net, postage extra.

Boerker, Richard H. D. *Our National Forests.*[1] Pp. 238. Illustrated. New York, The Macmillan Co. 1918. Price, $2.50.

Seton, Ernest Thompson. *Sign Talk.*[1] Pp. 237. Illustrated. Garden City, Doubleday, Page & Co. 1918. Price, $3.00 net.

The Harvard Travellers Club, prepared by. *Handbook of Travel.* Pp. 544. Illustrated. Cambridge, Harvard University Press. 1917. Price, $2.50. Presented by publishers.

Howe, William S. *War and Progress.* Pp. 136. Boston, LeRoy Phillips. 1918. Price, $1.00 net, postage extra. Presented by publishers.

Stefansson, Vilhjalmur. *My Life with the Eskimo.* Pp. 538. Illustrated. New York, The Macmillan Co. 1913. Price, $4.00.

[1] Obtained through membership in the Associated Mountaineering Clubs.

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GENERAL LIBRARY
MAR 28 1919

The BULLETIN of the GEOGRAPHICAL SOCIETY of PHILADELPHIA

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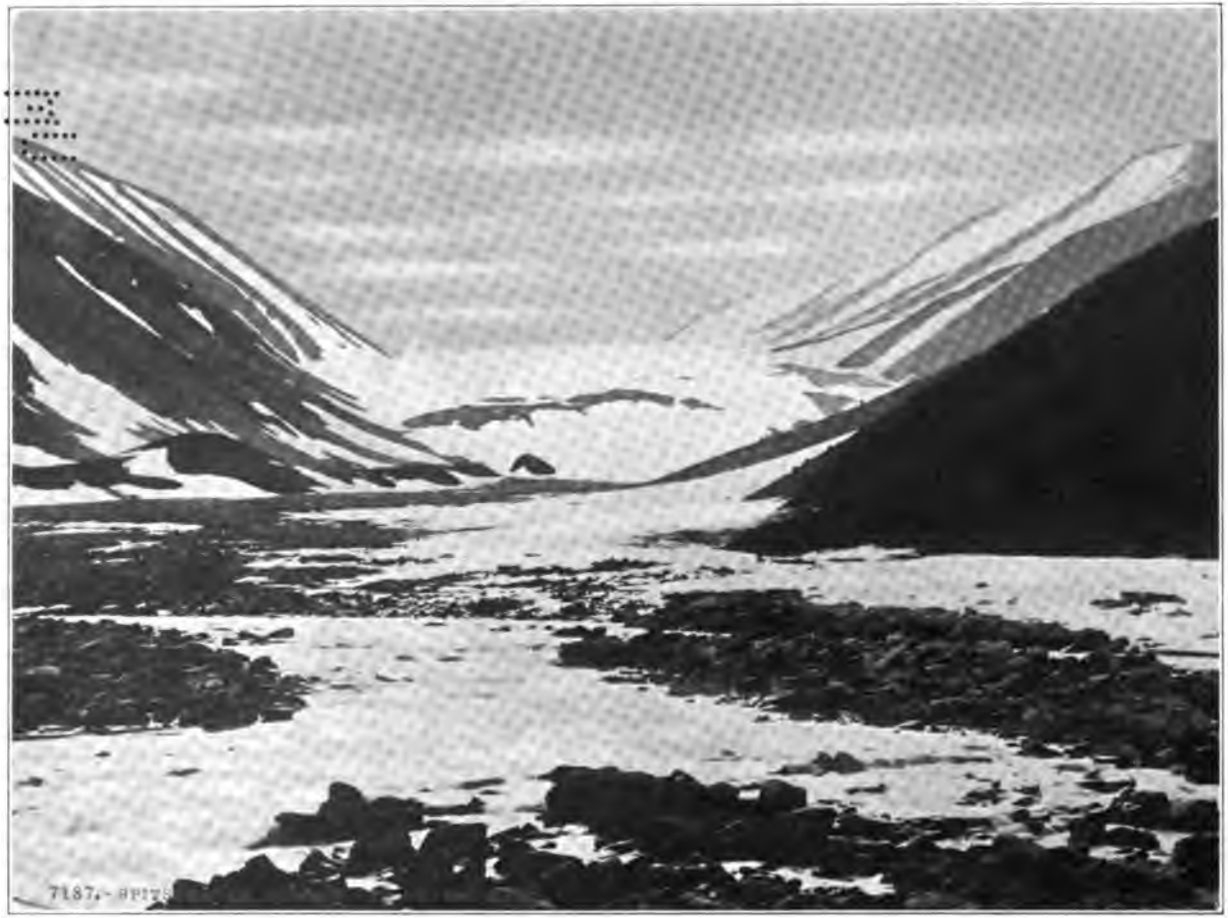

GLACIAL VALLEY, ADVENT BAY, SPITZBERGEN.

THE GEOGRAPHICAL RELATIONS OF THE NORTH AMERICAN FAUNA.[1]

SPENCER TROTTER, M.D.,

SWARTHMORE COLLEGE.

I.

A *fauna* is the collective animal life of a region. It may be quite restricted in area, or it may embrace a large domain as a continent. It is in this latter aspect that the present survey is concerned —the fauna or animal life of the North American Continent.

The elements of a fauna are various; there is, for example, an insect fauna, a mollusc fauna, a vertebrate fauna and of this latter a number of subdivisions as a mammalian, a bird, a reptile and an amphibian fauna, and a fish fauna. Our point of view in this essay is engaged with the vertebrate fauna and in this chiefly with birds and mammals. These highly developed vertebrates are good indices of faunal conditions, and they are familiar.

Let us glance for a moment at the more familiar species of the mammalian fauna of North America. Of carnivores there is the puma or cougar, a highly characteristic cat of the western world ranging from Canada to Patagonia. In the tropical area of the continent there is another large and dangerous cat—the jaguar—and also the little ocelot. In the north are the two species of lynx—the bay lynx, "catamount" or "bob-cat" and the larger Canada lynx or "lucifer." These all belong to the Felidæ. Of the Canidæ or dog family we have a number of native species—several species of foxes and wolves. The Mustelidæ or weasel family is well represented, chiefly northerly, with a large number of genera—the otters, skunks, weasels proper, including the mink and others like the fisher and the wolverine or glutton. The badger is akin to this group. Of the bear family (Ursidæ) there are several North American forms—the widely ranging black bear, the brown or cinnamon variety, the grizzly bears of the western mountain region and the huge bears of Alaska and the Barren Grounds. We might close this brief review of the Carnivora with the curious and unique family to which the raccoon belongs.

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[1] This essay is the substance of two lectures on the North American Fauna delivered in the Ludwick Institute Course at the Academy of Natural Sciences, Philadelphia, February 17–24, 1919.

Of rodents there is a vast array—a tree porcupine, numerous arboreal squirrels like our gray and red species and the large southern and western fox squirrels, a number of species of striped ground squirrels like the chipmunk, also spermophiles and gophers, a number of marmots as the familiar woodchuck or ground-hog (he of weather prophecy), the colonial "prairie dog" of the western plains country and the "whistler" of high mountain slopes. Very widespread throughout northern lands is the beaver and his work. There is a great host of native rats and mice, conspicuous among which is the highly peculiar musk-rat or "musquash" of our streams and marshes. Of hares we have many varieties from the eastern cotton-tail "rabbit" to the big "jack rabbit" of the western grass country, but no true rabbit is indigenous to America; they are all real hares, making a "form," not burrowing in warrens, and bringing forth perfect formed, furry, active young. A number of species of moles and shrews represent the insectivorous order in North America, and there are several kinds of bats. One strange marsupial—the opossum—ranges north to the valley of the Delaware.

Of the hoofed mammals or Ungulates there is a generous display. The bison, that once roamed the western plains and the prairie pastures of the Mississippi Basin in immense herds, now exists only as a protected remnant in the game preserves. The very peculiar "prong-buck" or "antelope," the only hollow-horned ruminant that sheds its horns, is altogether American. Of wild sheep there are several species of mountain "big horns," and the curious Rocky Mountain goat, which is no real goat at all, stands distinctly by itself. On the Arctic borders of the continent is that strange creature called the musk-ox (*Ovibos*). Of the deer family (Cervidæ) there is the moose of northern forests, the several species of caribou, the wapiti, miscalled "elk," which is a very near relative of the stag or red deer of Europe, and the American "buck" or Virginia deer with its western form, the mule deer.

This fairly completes a rough list of North American land mammalia. What is the origin of all these different types? Are they native, indigenous to the country, or are they of derived stocks, migrants from some other regions of the earth?

In order to understand the relationship of the North American fauna one must realize the close juxtaposition of the eastern and western continents about the north polar area. A glance at a polar projection will show this quite clearly. Further, one must be acquainted with the fact that this closely-related land condition was even more closely related in a former geological period. Where there is now a Behring Strait there was once a "land bridge," and still earlier the present reach of sea between Greenland and Scandinavia was the site of an ancient land area, so that in former times there was really a continuous circumpolar land that afforded a wide extent of country for migrating animals. At that time, too, the climate was mild and there was a luxuriant vegetation and consequently an abundant food-supply. Remains of such temperate types as the magnolia, sassafras, basswood, plane-tree, beech, birch, oak and other broad-leafed trees have been discovered in the deposits of Greenland and Spitsbergen. There were no doubt wide stretches of meadow land and broad grass-covered plains over which the herds grazed as they slowly spread around this northern circle of land.

While the continent of North America was thus in close physical relation with the Eurasian land, especially in the Behring region, South America, on the other hand, has always been more or less isolated from the rest of the world, save along the narrow isthmian strip that connects it with Middle America and through this with North America. These geographical relations have a very important bearing on the origin of the present vertebrate life of the western continent. A large element has been derived from Eurasian types, mainly during the geological period immediately preceding the present. It was a time of great mammalian migrations and profound climatic variations. This Pleistocene period was characterized by four well-marked glacial periods which spread a series of ice sheets over a large portion of the northern hemisphere. Between these glacial periods were intervening lapses of rather genial climatic conditions, often of considerable duration, known as interglacial periods. Prior to this Pleistocene time, during the several long periods of the Tertiary, a strange mammalian fauna inhabited North America. The camels originated here, of which the llamas of South America are modified survivals of the ancient type, and there were horses, elephants and rhinoceroses, as well as many other forms now extinct in the western land area, the living representatives of which are now mainly confined to the tropical regions of the old world.

The entire northern land surface of the earth—Eurasia, North Africa and North America—is in many ways a zoölogical unit, and is so regarded by zoölogists under the name of the Holarctic Region. It is natural to look for the origin of much of the recent North American life to the great Eurasian-African center of development. The bears are probably Eurasian, although they are so generally spread throughout the northern lands that it is difficult to say in just which of the regions they might have originated. The cats appear to have spread from some Eurasian center, and the same is true of the weasel group. The rodents and insectivores appear mainly to have been derived from old world sources, though in some instances highly modified in America. Wolves and foxes are of late Eurasian origin. The moose and the wapiti are both of the old world. Of Eurasiatic origin also are the bison (its near relative the European wood bison or "wisent" now, likewise on the verge of extinction), the Rocky Mountain goat (related to the chamois), the big-horn sheep, and the caribou or reindeer. These are all Pleistocene immigrants. Wild sheep have an interesting distribution; they are all mountain dwellers and a number of species have been developed in the spread of the type along the mountain axes from the Atlas and the Pyrenees through Sardinia, the Pamir, Thian Shan, Altai, and the ranges of western North America into Mexico. Of somewhat earlier date than the Pleistocene is the stock from which our Virginia deer has descended, several allied species ranging into South America. The curious prong-horn antelope is a specialized American type of old world origin. The musk-ox, likewise, is an immigrant from Eurasia.

Until the close of the Tertiary, North America was exceedingly rich in mammalian types of an archaic character. From some cause or other these forms suffered extinction in the western continent. The modern types are mainly Eurasiatic immigrants during the Pleistocene. Although but few, if any, absolutely authentic human remains of a fossil nature have been found in North American deposits it is quite probable that man was one of the species in the great faunal movement from Eurasia across the Behring land-bridge during the Pleistocene.

On the other hand certain elements in the recent mammalian fauna of North America are clearly of South American origin. Among these may be mentioned the raccoon, the tree-porcupine, and the opossum. This last, a marsupial, is extremely ancient and is probably related to that very primitive time when South America was connected with an Australian land by way of Antarctica. Skunks also appear to be peculiarly American, possibly of South American origin.

It seems quite clear from this evidence that Eurasia has furnished most of the recent mammalian life of the North American Continent, and this during the latest geological period—the Pleistocene. Roughly measured this lapse of time was not less than five hundred thousand years, possibly a million years or more.

Of the existing bird life of North America we have little direct evidence as to origin from the very scanty relics of a fossil nature. Bird skeletons are fragile and disappear before fossilization can be accomplished, in the great majority of cases. What evidence we have is mainly along lines of the present distribution of groups—the largest number of species in the range of a genus. The same geographical conditions hold good as in the case of mammals—the continuous northern area and the South American connection. Birds, more than mammals, have in their power of flight a greater ability in overcoming obstacles and yet in regard to climatic and food conditions they are equally restricted. In this survey we may neglect water birds as their natural surroundings (shores and bordering oceans) are quite uniform, and a large number of species are wide-spread, often cosmopolitan. Some years ago Dr. J. A. Allen gave a very comprehensive review of our present land-bird fauna.[2] According to Dr. Allen's view, based on the present distribution of species in the various genera cited, there are four main sources from which our bird fauna has been derived—the northern old world area, the plateau region of Middle America and south western North America, tropical America, and eastern North America.

From Eurasian sources have been derived such forms as the robin, the wood thrush group, the titlark, the barn, cliff, and bank swallows, the kinglets, cedar bird, crossbills, purple finch, pine grosbeak, red-poll linnet, the longspurs and snow bunting, crows, jays, titmice, nuthatches, creepers, the shrikes and shore larks. Of western plateau and Middle American origin are the thrashers, bluebirds, chewinks, the bob-whites, and the wild turkey. From tropical South America and the Antillean region have come our vultures. certain hawks and owls, the cuckoos, most of our woodpeckers, nighthawks, whip-poor-wills, and swifts, the hummingbirds, and all of our flycatchers, orioles, blackbirds, vireos, tanagers, gnatcatchers, mockingbirds, several wrens, and among warblers the yellowthroats and redstarts. Certain sparrows and the rose-breasted and blue grosbeaks and the indigo bird are likewise of tropical origin. A fourth group of passerine birds seem to have few nearly related forms outside of the eastern part of North America—such as the bobolink, the prothonotary, worm-eating and wood warbler group, the oven-bird and Kentucky warbler groups, the flycatching warblers, the catbird, and the marsh wrens. All of these appear to be eastern indigenes. This great influx of avian types probably occurred in the latter half of Tertiary and throughout the Pleistocene. Our evidence is altogether based on the present distribution of the species in each of the above-mentioned generic types; the numerical preponderance of species in a region indicating that region as the center of development of the group in question.

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[2] *The Auk*, Vol. X, p. 97, April, 1893.

Most of our reptiles and amphibians have undoubtedly originated from tropical American stocks, although the late Arthur Irwin Brown pointed out very clearly a post-glacial center of dispersal for reptiles in the southeastern United States.[3] There is a curious hiatus in the distribution of the pit vipers (such forms as the rattlesnakes, copperhead, fer-de-lance, bushmaster and others) certain of these snakes occurring in southeastern Asia as well as in America, but nowhere else in the world.

II.

The present features of the distribution of animal life in North America are in the main the result of two factors: (*a*) the geological history of the land and (*b*) the distribution of vegetation. As has already been observed animals are fundamentally related to vegetation. This conditions the particular ***habitat*** of each and every species of terrestrial animal. Zoölogists have long recognized certain characteristic assemblages of animals in certain regions of country and to these they have given the name of "faunas." In the eastern part of North America there are five such zoögeographical areas, each one of which is defined by the presence of certain species of mammals, of certain birds during the breeding season, and of particular reptile and amphibian types. Each one of these "faunas" corresponds to some broad feature of vegetation.[4]

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[3] Brown, Arthur Irwin, "Post-Glacial Nearctic Centers of Dispersal for Reptiles," *Proc. Acad. Nat. Sci. Phila.*, Vol. LVI, pt. II, p. 464, 1904.

1. *The Sub-Arctic or Hudsonian Fauna.*—This is a Barren Ground and tree-limit type, notably developed about the Hudson Bay region. On the Barren Grounds the musk-ox, Barren Ground caribon, Barren Ground bear, Arctic fox, two genera of lemming. Parry's spermophile, the red-backed mouse, and the Arctic hare are characteristic. An abundant crop of crowberry and cloudberry afford a food supply for such breeding birds as the golden plover, the curlew and numerous waterfowl, besides the longspurs and snow bunting, the red-poll linnet, northern horned lark, the wheatear, pipit, willow ptarmigan and raven.

On the tree-limit border occur such species as the gray wolf, the ermine and wolverine. The black bear does not range north of this zone and this is true also of the lynx, the fisher, the red squirrel and the woodchuck. Certain birds, as the Bohemian waxwing and northern shrike, and several species of warblers and thrushes breed in this tree-limit area.

2. *The Coniferous Forest or Canadian Fauna.*—Like the above this region is one made up largely of old world types—the moose, wapiti and woodland caribou among mammals, and numerous species of birds such as the purple finch, the crossbills and pine grosbeak, the evening grosbeak, the pine siskin, brown creeper, winter wren, and the two kinglets. Among the more typical American species are several wood warblers, the white-throated and white-crowned sparrows, the fox sparrow, junco, tree sparrow, the

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[4] Trotter, Spencer, "The Faunal Divisions of Eastern North America in Relation to Vegetation," *Journal Academy of Natural Sciences of Philadelphia,* Vol. XV, Second Series, Commemoration volume, Philadelphia, 1912.

Canada jay and certain flycatchers. Among the mammals the Canada porcupine, and the jumping mouse are highly characteristic of this fauna.

3. *The Northern Hardwood Forest or Alleghanian Fauna.*—Certain of the northern mammals do not extend their southward ranges into this forest as the moose, caribou and porcupine. It is typically a transition zone where northern and southern species of animals mingle or overlap. Its characteristic trees are maples, birches, beeches, white pine and hemlock. Birds that breed within its domain but that do not range north of it are the bob-white, wild turkey, dove, meadow lark, both species of orioles, the chewink, indigo bird, rose-breasted grosbeak, thrasher, house wren, vireos, tanagers, the wood thrush and the bluebird. It likewise limits the northward range of certain reptiles, notably snakes and lizards.

4. *The Carolinian Fauna.*—This fauna characterizes several large areas of vegetation. It is notably associated with the great interior hardwood forest of alluvial soils and rich bottom lands on both the eastern and western sides of the Appalachian highland. It spreads over the coastal plain and the maritime marshes and displays in certain areas a charcteristic "pine-barren" fauna that occurs from New Jersey southward. In the region about Philadelphia the Carolinian fauna is in contact with the Alleghanian along the "fall-line" (200-foot contour). It is characterized by limiting the northward extension of certain species—the opossum and gray fox among mammals, and the turkey buzzard, barn owl, Acadian flycatcher, cardinal, Carolina wren, chat, and the worm-eating, blue-winged yellow, Kentucky and hooded warblers among birds. The prairie and the pine warbler are characteristic birds of the pine barrens and Bachman's sparrow in the pine woods of the Southern States. It is particularly rich in reptiles—numerous species of snakes, lizards and turtles—besides many forms of amphibians.

5. *The Austroriparian Fauna.*—This is a fauna of the gulf border and South Atlantic coastal. It is characteristically associated with a flood-plain forest (bayou and river bottom) where such trees as the bald cypress, and on drier ground the live oaks, predominate, the branches of which are festooned with tillandsia moss. It is a region of amphibians and reptiles, many forms being peculiar. Among the more characteristic birds are the pelican, the darter or

snakebird, the wood ibis, two genera of kites, the Carolina paroquet, the ivory-billed woodpecker, Swainson's, Bachman's, the prothonotary and yellow-throated warblers, the painted finch and other species that do not range north of its borders. In certain low-lying districts along the Atlantic seaboard to the north there is a decided Austroriparian tinge, especially in the bird fauna. The most northerly of these stations is in the bottom land along the Choptank River in Maryland.

The western half of North America is under entirely different physical influences, being a plateau land more or less closely related biologically with Mexico and the region farther south. It is decidedly arid, in marked contrast with the eastern humid portion of the continent. To the north the great belt of coniferous woodland that stretches from western British America eastward to the northern borders of New England presents a quite uniform character in its life conditions.

ZERO BIRDS.

SAMUEL SCOVILLE, JR.

It had been a strenuous night. All day the mercury had been flirting with the zero mark and soon after sunset burrowed down into the bulb below all readings. My bed that night felt like a well-iced tomb. Probably daylight would have found me frozen to death if it had not been for a saving idea. Hurrying into the children's room I selected two of the warmest and chubbiest. Banking them on either side of me in my bed I just survived the night. Of course it was hard on them but then any round, warm child of proper sentiments should welcome an opportunity to save the life of an aged parent. In spite of my patent heating plant I woke up toward morning shivering and remembered with a terrible depression that I had boasted to Mrs. Naturalist and to various and sundry scoffing friends that I would cut down and cut up and haul in one forty-foot hickory tree before the glad New Year. For a while I decided that there was nothing on earth worth exchanging for that warm bed. Finally, however, my better nature conquered and the dusk before the dawn found me in the woods in front of a dead hickory tree some forty feet high and a couple of rods through —at least that was how its flinty girth impressed me after I had chopped awhile. The air was like iced wine. Every axe-stroke drove it tingling through my blood.

Before attacking the hickory, however, I began to cut down the brush surrounding the doomed tree so as to gain clear space for the axe-swing. Almost immediately a vindictive spice-bush in falling knocked off my glasses and they fell into the snow somewhere ahead of me. Without them I am in the same condition as a mole or a shrew, my sense of sight being only rudimentary. Down I plumped on my knees in the snow and fumbled in the half light with numbed fingers through the cold whiteness ahead of me. As I groped and grumbled in this lowly position, suddenly I heard the prelude to one of the most beautiful of winter dawn-songs. It was a liquid loud note full of rolling r's. Perhaps it can be best represented in print somewhat as follows: "chip'r'r'r'r." I forgot my lost glasses and my cold hands and my wet knees waiting for the song that I knew was coming. Another preliminary, rolling note or so and there sounded from a low stump a wild, ringing song that could be heard for half a mile. "Wheedle-wheedle-wheedle" it began full of liquid bell-like overtones. Then the singer added another syllable to his strain and sang, "Whee-udel, whee-udel, whee-udel." Three times with a short rest between he sang the full double strain through, although it was so dark that only the ghostly, black tree-trunks could be seen against the white snow. I needed no sight of him, however, to recognize the singer. The song took me back to a bitter winter day in Philadelphia some seventeen years ago when I was laboriously learning the birds. I was walking through a bit of waste-land encircled by trolley-tracks when I heard this same song. It was like nothing which I had ever heard in New England, where I had learned what little I knew about birds, and I searched everywhere for the singer, expecting to see a bird about the size of a robin. Finally in the underbrush just ahead of me I saw an unmistakable wren singing so ecstatically that he shook and trembled all over with the outpouring of his song. It was my first sight and hearing of this southern bird, the Carolina wren, the largest of our five wrens, whose field-mark is a long white line over the eye. He is reddish-brown while the house wren, which is half an inch shorter, is cinnamon-brown. The long-billed marsh wren also has a white line over the eye and is about the same size, but is never found away from the tall grass bordering on water and has no such song as the Carolina. The winter wren and the short-billed marsh wren could neither of them be mistaken for the Carolina, as they are both about an inch and a half shorter and lack the white line. The house wren and the long-billed marsh wren bubble when they sing, the Carolina wren and the winter wren ring and the short-billed marsh wren, the rarest of all, clicks. Of them all only the Carolina wren sings in the winter.

That day the wren-song brought me good luck. It was no more than finished when I heard someone passing along a nearby wood-road, who turned out to be an early-rising workman from whom I borrowed some matches with which I finally discovered my missing eyes half buried in the snow. I attacked the pignut hickory with great energy to make up for lost time. Little by little the axe bit through the tough wood until the kerf was well past the heart of the tree. As I chopped I could hear the quick strokes of a far better wood-cutter than I will ever be. Suddenly he gave a loud, rattling call and I recognized the hairy woodpecker. He is much larger than the downy, being nearly the size of a robin, while his call is wilder and louder and lacks the downward run of the downy's note. We chopped on together, he at his tree and I at mine. Suddenly from my tree sounded a warning crack and the trunk wavered for a moment. I stepped well off to one side, for it is dangerous to stand behind a falling tree. If it strikes anything as it falls the trunk may shoot backward. A venerable ancestor of mine, so the story runs, tried to celebrate his ninetieth birthday by chopping down a tree, and standing behind it was killed by the back-lash of the falling trunk.

The tree swayed forward toward the crimson rim of the rising sun. One more stroke at its heart and there was a loud series of cracks followed by a roar like thunder as it crashed down. Almost immediately, as if awakened by the noise, I began to hear bird-notes. From over to my left sounded a series of sharp, irritating alarm notes and in the waxing light I caught a glimpse of a crested blood-red bird at the edge of a green-brier thicket. In that same place I had found his nest the spring before made of twigs and strips of bark and lined with grass and roots and holding three speckled eggs. It was the cardinal grosbeak, another bird unknown to me in New England. No matter how often I meet this crimson-crested grosbeak he will never become a common bird to me. Each time I see him I feel again something of the thrill which came over me when I first met this singer from the southland in a thicket on the edge of Philadelphia. With the Carolina wren and the tufted titmouse, the cardinal grosbeak completes a trio of birds that can never be commonplace to one born north of Central Park, New York, which is about the limit of their northern range. To-day as I watched my flaming cardinal, he suddenly dived stiffly into the heart of the thicket. A moment later from its midst sounded a clear, loud whistle, "Whit, whit, whit." I answered him, for this is one of the few bird-calls I can imitate. Before long his dove-colored mate also appeared. Her wings and tail were of a duller red, while the upper-parts of her sleek body were of a brownish-ash tint. The throat and a patch by the base of the bill in both were black. As I watched, the singer in the thicket added to his whistle the word "teu, teu, teu, teu" and then finally ran them together—"Whee-teu, whee-teu, whee-teu" so rapidly whistled that it almost sounded like a single note.

On the way back to breakfast as the sun came up and warmed a slope of the woods, a flock of slate-colored juncos burst out altogether in a chorus of soft, little trills with now and then sharp alarm-notes like the clicking of pebbles together interspersed with tiny half-whispered notes best expressed by the same letters as those used in writing the grosbeak music—"teu, teu, teu, teu." Suddenly from a farther corner of the sun-warmed slope, I heard a few tinkling notes followed by a tantalizing snatch of rich, sweet song shot through with canary-like trills and runs. I hurried over the snow and caught a glimpse of a little flock of birds with crowns of reddish-brown and each wearing small black spots in the exact center of their drab-colored waistcoats. They were tree-sparrows down from the far North and I was fortunate to have heard the peculiarly gentle cadence of one of their rare winter-songs.

Farther on the caw of a passing crow drifted down from the cold sky and before I left the woods I heard the pip of a downy woodpecker and the grunt of the white-breasted nuthatch, that tree-climber with the white cheeks which unlike woodpeckers can go up and down trees head-foremost. In the early spring and sometimes on warm winter days one may hear his spring song which is "quee-quee-quee." It is not much of a song but Mr. Nuthatch is very proud of it and usually pauses admiringly between each strain. In my early bird-days I used to mistake this spring song for the note of an early flicker and would scandalize better-educated ornithologists by reporting flickers several weeks before their time. The last bird I heard before I left the woods, remarked solemnly "Too-wheedle, too-wheedle, too-wheedle, too-wheedle" like a creaking wheelbarrow, and then suddenly broke out into the flat, harsh "Djay, djay, djay" which has given the silver-and-blue jay its name.

By the time I had reached home I decided that it was too cold a day to safely practice law. The state legislature in their wisdom had already made the day a half-holiday. Not to be outdone in generosity, I decided to donate my half and make the holiday a whole one. Anent this matter of holidays, the trouble with most of us is that we are obsessed with the importance of our daily work. There are many pleasant byways which we plan to come back and explore when we have reached the end of the straight, steep and intensely narrow road that leads to achievement. The trouble is that there is no returning. Men die rich, famous or successful who have never taken the time to companion their children or to find their way into the world of the wild-folk which lies at their very doors. It was not always so. Read in Evelyn's diary how for sixty years a great man played a great part under three kings and the grim Protector and yet never lost an opportunity to refresh his life with bird-songs, hilltops, flower-fields and sky-air. We reach our goal to-day in a few desperate years, stripped to the buff like a Marathon runner. One can arrive later and not miss a thousand little happinesses along the way.

With similar arguments I convinced myself on that day, that it was my duty as an amateur naturalist to discover how many birds I could meet between dawn and dark with the thermometer below zero. Certain gentlemen-adventurers of my acquaintance aided and abetted me in this plan. They all held high office in a military organization known for short as the Band. There was First Lieutenant Trottie, Second Lieutenant Honey, Sergeant Henny-Penny and Corporal Alice-Palace, while I had been honored with a captain's commission in this regiment. To be sure, there was something of a dearth of privates but with such a gallant array of officers their absence was not felt. At any hour of day or night, to the last man, every member of the Band was ready for the most desperate adventures by field and flood.

As we left the house the thermometer stood at four below, while the sky was of a frozen blue without a cloud and had a hard glitter as if streaked with frost. In a low tree by the roadside, we heard the metallic note of a downy woodpecker scurrying up the trunk and backing stiffly down. Further on sounded a loud cawing and we saw four ruffianly crows assaulting a respectable female broad-winged hawk. One after the other they would flap over her as closely as possible, aiming vicious pecks as they passed. The broad-winged beat the air frantically with her short, wide, fringed wings and seemed to make no effort to defend herself against her black, jeering pursuers. Once she alighted on an exposed limb. Instantly the crows settled near her and used language which no respectable female hawk could listen to for a moment. She spread her wings and soared away and as she passed out of sight they were still cawing on her trail. If the hawk had been one of the swift Accipiters such as the gray goshawk or the Cooper's hawk, or any of the Falcons no crow would have ventured any liberties. One of my friends, who collects birds' eggs instead of bird-notes, was once attempting to feloniously break and enter the home of a duck-hawk which was highly regarded in the community—about two hundred feet highly in fact. As my friend was swinging back and forth on a rope in front of the perpendicular cliff said duck-hawk dashed at him at the rate of some ninety miles per hour. Being scared off by a blank cartridge the enraged falcon towered. A passing crow flapping through the air made a peck at the hawk as it shot past. That was one of the last and most unfortunate acts in that crow's whole life. The duck-hawk was fairly aching with the desire to attack someone or something which was not protected by thunder and lightning. With one flash of its wings it shot under that misguided crow, and, turning on its back in mid-air, slashed it with six talons like sharpened steel. The crow dropped a dead mass of black and blood to the brow of the cliff below.

Finally we reached the tall, stone chimney, all that is left of some long-forgotten house which marks the entrance to old Darby Road which was opened in 1701. At that point Wild-Folk Land begins. The hurrying feet of more than two centuries have sunk the road some ten feet below its banks, and the wild-folk use its hidden bed like one of their own trails. Foxes pad along its rain-washed course, and rabbits and squirrels hop and scurry across its narrow width, while in spring and summer wild ginger, ebony spleenwort, the blue-and-white porcelain petals of the hepatica and a host of other flowers bloom on its banks. The birds too nest there, from the belted gray-blue and white kingfisher, which has bored a deep hole into the clay under an overhanging wild-cherry tree, down to the field-sparrow with its pink beak and flute-song which watches four speckled eggs close-hidden in a tiny cup of woven grass.

To-day we followed the windings of the road until we came to the vast black oak tree which marks the place where Darby Road, after running for nearly ten miles, stops to rest. Beyond stretched the unbroken expanse of Blacksnake Swamp bounded by the windings of Darby Creek. The Band seated themselves on one of their favorite resting-places, a great log which lay under the trees. Above us a white-breasted nuthatch with its white cheeks and black head was rat-tat-tatting up and around a half-dead limb, picking out every insect egg in sight from the bark. As the bird came near the broken top of the bough, out of a hole popped a very angry red squirrel exactly like a jack-in-the-box. The red squirrel is the fastest of all the tree-folk among the animals but a nuthatch on a limb is not afraid of anything that flies or crawls or climbs. He can run up and down around a branch forward and backward, unlike the woodpeckers which must always back down or the brown creepers which can go up a tree in long spirals but have to fly down.

A red streak flashed down the limb on which the nuthatch was working. That was the squirrel. A fraction of a second ahead of the squirrel there was a wink of gray and white. That was the nuthatch. Before the squirrel could even recover his balance there was a cheerful rat-tat-tat just behind him on the other side of the limb. As the squirrel turned the rapping sounded on the other side of the branch. His bushy, red tail quivered, and using some strong squirrel-language, he dived back into his hole. He was hardly out of sight when the nuthatch was tapping again at his door. Once more the squirrel rushed out chattering and sputtering. Once more the nuthatch was not there. Then he tried chasing the bird around the limb but there was nothing in that. The nuthatch could turn in half the time and space and moreover did not have to be afraid of falling, for a drop of fifty feet to frozen ground is no joke even for a red squirrel. The aggravating thing about the nuthatch was that no matter how hard the squirrel chased him he never stopped for a second, tapping away at the branch, feeding even as he ran. Finally Mr. Squirrel went back to his house and stayed there, while the nuthatch tapped in triumph all around his hole, although muffled chatterings from within expressed the squirrel's unvarnished opinion of that nuthatch.

When the nuthatch finally flew to another tree, we got up and followed a path that twisted through a barren field full of grassy tussocks and clumps of mockernut hickories and black walnut trees until it at last lost itself in the depths of Blacksnake Swamp. This swamp had taken its name from the day that we caught a blacksnake skimming along over the tops of the bushes like a bird. In summer it is full of impassable quagmires and to-day we hoped to explore the hidden places which we had never yet seen. We had scarcely passed through the outer fringe of tall grasses and cat-tails, when we heard everywhere through the cold air little tinkling notes and caught glimpses of dark sparrow-like birds with forked tails, striped breasts and streaked rich brown backs, each one showing a fine zigzag whitish line at the bend of the wing. Another field-mark was a light patch over each eye and we identified the first and largest flock of pine siskin of the year. These siskin are strange birds. One never knows when and where they will appear. The last flock that I had seen was in my back-yard in May. Usually too they are in trees and this was the first time that I had ever met with them on the ground. The birds gave little canary-like notes like goldfinches which are often found with them; but can always be recognized by their unstreaked breasts and double wing-bars. For a long time we studied the flock through our field-glasses until every last one of the Band had learned this new bird. As we watched them, a white-throated sparrow lisped from a nearby bush and a little later we met a flock of tree sparrows, a bird which is never by any chance found in a tree. In the distance a woodpecker flew through the air in a labored up-and-down flight, and, as he disappeared, he gave the wild cry of the hairy woodpecker, a bird nearly twice the size of his smaller brother, the downy. Close by the side of the creek, we heard a tiny note like "pheep, pheep, pheep," and, even as we looked for the bird, it flew past and lit on a tree on the other side of the path not two feet away. We all stood stony still and in a minute a brown creeper circled the tree, climbing it in tiny hops in a wide spiral. He was so close that we could see his stiff, spiny tail with a little row of spots at its base and the brown and gray speckles on his back and his long curiously curved bill.

We pressed on into the very heart of the great, treacherous marsh, to-day frozen hard and safe, and explored all of its secret places. In a tangle of wild-grape vine, we found the round nest, rimmed with grape-vine bark, of the cardinal grosbeak while over in a thicket of elderberry bushes all rusty-gold with the clinging stems of that parasite, the dodder, showed the close sheath of the fine branches of a swamp maple. In a fork at the end of one of the branches, all silver-gray was the empty nest of a goldfinch, the last of all the birds to nest. It was made of twisted strands of the silk of the milkweed pods hackled by the bird's beak. In the snow, we came across a strange track almost like the trail of a snake. It was a wide trough with little close-set, zigzag paw-marks running all through it. The Captain told the Band that this was the trail of the fierce blarina shrew, one of the killers. Without eyes or ears, this strange little blind death eats twice its weight in flesh every twenty-four hours and slays underground, above ground and even under the water. The Band regarded the strange tracks with enormous interest.

"How big do they grow?" anxiously inquired Henny-Penny, the littlest but one of the Band.

"Just a little longer than my middle finger," the Captain reassured him.

Suddenly in the very midst of this zoological bric-a-brac, a great thought came to each and every of the Band simultaneously.

"Lunchtime!" they shouted with one accord.

Then occurred the tragedy of the trip. In a pocket of his shooting-jacket the Captain had a package of sandwiches containing just one apiece, no more, no less. The rest of the lunch, thick scones, raisins, chocolate, saveloy sausage, bacon and other necessaries and luxuries had been wrapped up in another package and intrusted to Honey as head of the commissary department for the day—and Honey had left the package on the hall-table! It was a grief almost too great to be borne. The Band regarded their guilty comrade reproachfully. Two large tears ran down Honey's cheeks. Alice-Palace, the littlest of them all, gave way to unrestrained emotion which bade fair to frighten away the most blood-thirsty of blarinas within the radius of a mile. Then it was that the Captain rose to the emergency.

"Comrades," said he, placing one hand over Alice-Palace's widely-opened mouth, "all is not lost. Old woodsmen like ourselves can find food anywhere. Follow me. Hist!"

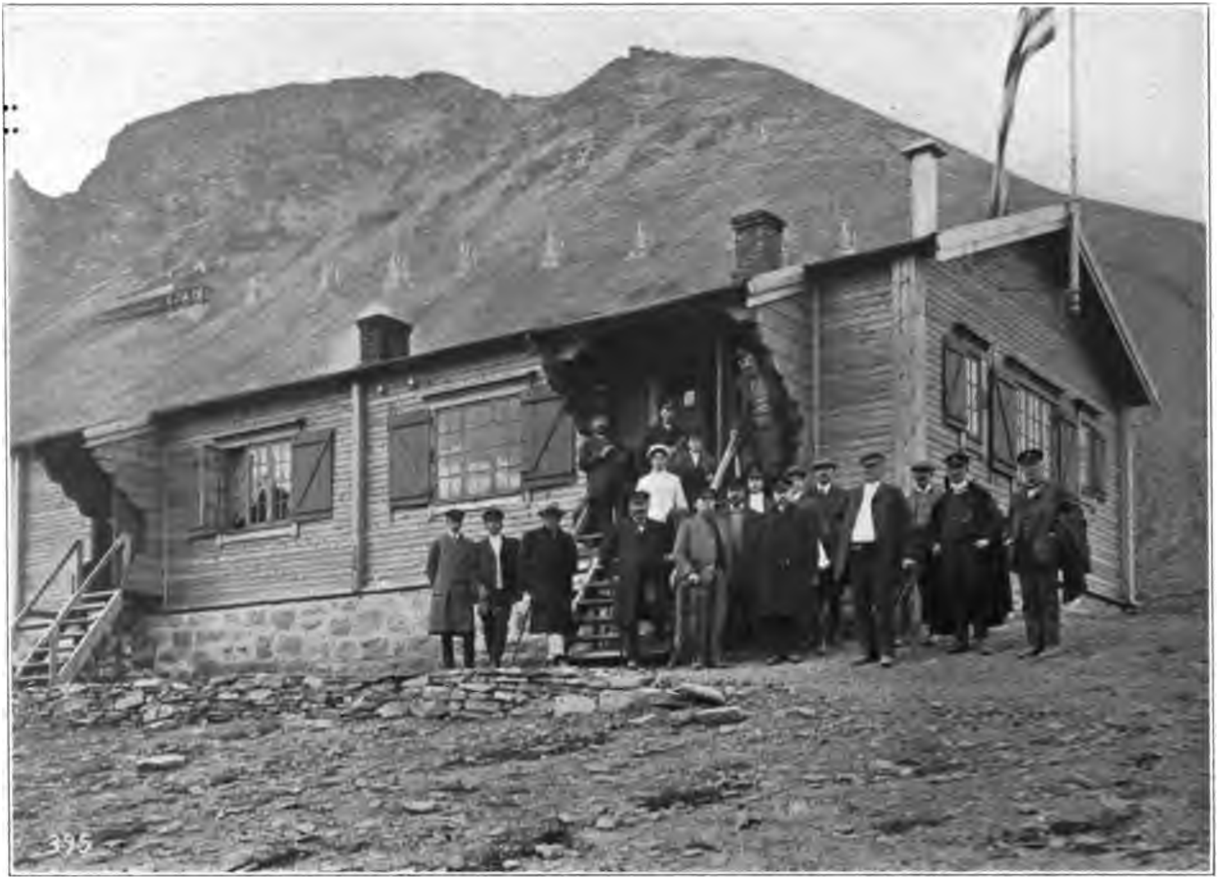
Like Hawk-Eye and Chingachguch and other well-known scouts, the Captain was apt to employ that mysterious word when beginning a desperate adventure. The Band followed him with entire confidence, albeit with certain snifflings on the part of Corporal Alice-Palace. They crossed a tiny brook and found themselves in a little grove of swamp-maples which had grown up around the fallen trunk of the parent tree. The Captain scanned the trees carefully. Everywhere were trails in the snow which the Captain told them were the tracks of gray squirrels. Suddenly he reached up and picked out from between a little twig and the smooth trunk of a swamp maple sapling a big, dry, beautifully-seasoned black walnut. That started the Band to looking and they found that the little trees were filled with walnuts, each one wedged in between twigs or branches so that it would not blow down. Up and down and about the low trees climbed and scrambled the Band. Some of the nuts were hidden and some were in plain sight but altogether there was nearly a peck of them, each one containing a dry, crisp, golden kernel which tasted as rich and delicious as it looked. They had come upon the winter storehouse of a gray squirrel family. Piling the nuts in the lee of a big oak tree where the camp-fire was to be made, they followed the Captain to a broken-down rail fence where grew a thicket of tiny trees with smooth trunks whose gray twigs were laden down with bunches of what looked like tiny purple plums. Each one had a layer of pulp over a flat stone and this pulp, what there was of it, had a curious attractive spicy, sugary taste. The Captain told the Band that these were nanny-plums, sometimes known as sweet viburnum. Further on they found clusters of little purple fox-grapes, fiercely sour in the fall; but now sweetened enough under the bite of the frost to be swallowed. Still the Captain was not ready to stop. Up the hillside he led them by a winding path through tangled thickets until in a level place he brought them to a group of curious trees. The bark of these was deeply grooved and in places nearly three inches thick, while the branches were covered with scores and scores of golden-red globes. Some were wrinkled and frost-bitten until they had turned brown, but others still hung plump and bright in the winter air. It was a grove of persimmon trees. Before he could be stopped Henny-Penny had picked one of the best looking of the lot and took a deep bite out of the soft pulp. Immediately thereafter he spat out his first taste of persimmon with great emphasis, his mouth so puckered that it was with difficulty that he could express his unfavorable opinion of the new fruit.

"Handsome is as handsome does," warned the Captain. "Try some of the frost-bitten ones."

The Band accordingly did so, and found that the worst-looking and most wrinkled specimens were sweet as honey and without a trace of pucker. On their way back, they passed through a thicket of tangled bushes whose branches were all matted together in bunches which looked like birds' nests. The twigs were laden down with round, purple berries about the size of a wild cherry and the Captain told the Band that these were hackberries, otherwise known as sugar-berries. They picked handfuls of them and found that the berry had a sweet spicy pulp over a fragile stone that could be crushed like the stones of a raisin while the fruit when eaten resembled a raisin in taste. Hurrying back to the camp-fire tree, the Captain dug a round circle a couple of feet in diameter in the snow and spread down a layer of dry leaves. Over these he built a little tepee of tiny, dry, black-oak twigs. Underneath this, he placed a fragment of birch-bark which he had peeled off one of the aspen birches which grew on the fringe of the swamp. This burned like paper and in a minute the little ball of dry twigs was crackling away with a steady flame. Over this he piled dry sassafras and hickory boughs and in a few moments the Band was seated around a column of flame which roared up fully four feet high. With their backs against the great oak tree, they cracked and cracked and cracked black walnuts and crunched sugar-berries and nibbled nanny-plums and tasted frost-grapes—saving the single sandwich until next to the last, while for dessert they had handfuls and handfuls of honey-sweet, wrinkled persimmons. Near the fire Lieutenant Trottie found an old box-cover bedded in the snow. Lifting it up there was a rush and a scurry, and, from a round, warm nest underneath the cover made of thistle-down, fur, feathers, and tiny bits of wood-fiber all matted together into a sort of felt, dashed six reddish-brown, pink-pawed mice. They burrowed in the snow, crept under the leaves, and in a minute were out of sight, all except one which tried to climb the box-cover and which Trottie caught before he could scurry over the top of it. His fur was like plush, with the hair a warm reddish-brown at the ends and gray at the roots. Underneath he was snowy-white, although there, too, the fur showed mouse-gray under the surface. He had little brown claws and six tiny pink disks on each paw, which enabled him to run up and down perpendicular surfaces. His eyes were big and brown and lustrous, and he had flappy, pinky-gray, velvet ears, each one of which was half the size of his funny little face and thin as gossamer. His paws were pink and his long tail was covered with the finest of hairs. When he found he was fairly caught he snuggled down into Trottie's hand, making a queer, little, whimpering noise, while his nose wrinkled and quivered. When Trottie brought him to the fire Henny-Penny offered him a half kernel of one of his walnuts. Instantly the little nose stopped quivering and Mousy sat up like a squirrel on the back of Trottie's hand and nibbled away until the piece was all gone. Each one of the Band took turns in feeding him until he could eat no more. Then Trottie put him back in the deserted nest and replaced the box-cover.

The last adventure of all was on the way home. We were walking along an abandoned railroad track when suddenly a flock of light grayish birds flew up all together out of the dry grass and lighted in a small elm tree nearby. As we watched them they turned and all flew down together. Instantly it was as if a mass of peach blossoms had been spilled on the withered grass and white snow. Fully a third of the flock had crimson crowns and rose-colored breasts, while at the base of the streaked gray-and-brown backs, showed a tinge of pink. It was our first flock of the lesser redpolls all the way down from the Arctic Circle. They were restless but not shy and sometimes we were able to get within six feet of them. They would continually fly back and forth from the tree to the ground, keeping up a soft chattering note interspersed with little tinkling notes, somewhat resembling the goldfinch or the siskin which we had left behind us in the swamp. Always when they flew, they gave a little piping note and their field-mark was a black patch under the throat which could be seen even farther than their red polls or their rosy breasts. Their beaks were light and very pointed and they had forked tails like the siskin. It was nearly twilight when we left them and finally started home. As we followed a fox-trail in and out throught the thickets of Fern Valley, we caught a glimpse of a large, brown bird on the ground. At first I thought that it was some belated fox-sparrow; but when it hopped to a low twig and then unconsciously and nervously raised its tail stiffly as I watched, I recognized the hermit thrush which always betrays itself by this curious mannerism. The last one I had seen was singing like Israfel, whose heart-strings are a lute, in the twilight of a Canadian forest. To-day the little singer was silent and I wondered what had kept him back from the southland and hoped that he would be able to win through the bitter days still ahead of him. I have no doubt that he did, for the hermit thrush is a brave-hearted, hardy, self-reliant bird.

The sun had gone down before we finally reached the road. Above the after-glow showed a patch of apple-green sky against which was etched the faintest, finest and newest of crescent moons. It almost seemed as if a puff of wind would blow her like a cob-web out of the sky. Above gleamed Venus, the evening star all silver-gold, while over toward the other side of the sky, great golden Jupiter echoed back her rays. Below the green, the sky was a mass of dusky gold which deepened into amber and then slowly faded. As we walked home through the twilight we heard the last, sweetest and saddest singer of that winter day. Through the air shuddered a soft tremulo call like the whistling of swift, unseen wings or the wail of a little lost child. It was the eerie call of the little screech-owl—and never was a bird worse named. Answering I brought him so close to us that we could see his ear-tufts showing in the half-light. All the way home he followed us, calling and calling for some one who will never come.



German Tourists Visiting Office of American Coal Company, Advent Bay, Spitzbergen, July, 1910.

NO MAN'S LAND.

(SPITSBERGEN.)

Note.—The political status of Spitsbergen is a question at present attracting the attention of publicists and statesmen in Europe. Among the many problems of a territorial nature confronting the Peace Conference, this one is not the least puzzling. Various governments have in times past asserted claims to portions of this northern outpost of civilization. Aside from the fisheries, the economic resources of the region are destined to become important as other deposits, in more accessible parts of the world, become depleted. The subjoined article, reprinted from *The Spectator,* may be assumed to reflect the British point of view, and is here reproduced as an interesting contribution to a minor chapter of contemporaneous European history and geography.—Editor.

The recent annexation of Spitsbergen to the British Empire, which passed almost unnoticed amid the stirring events of the war, has settled a very old and curious problem. We have heard much of No Man's Land, between our lines and the enemy's, which our troops had to cross so often at great risk. The group of large islands far within the Arctic Circle had been for ages a political No Man's Land, to which all the Northern States laid claim more or less vaguely, but in which no one State asserted a jurisdiction. Spitsbergen could not exercise its "right of self-determination," because it had no inhabitants except reindeer and bears. Nor could it be said to pertain naturally to any one of the Northern Powers, from which it was separated by at least three hundred miles of stormy seas. Yet the archipelago offered such attractions to tourists, to whalers, and to miners that it was frequented in the summer months by an increasing number of people of various nationalities. Spitsbergen contains mountains of minerals, in a literal sense, and enterprising men thought it worth while to send ships to load the coal and iron ore which might be had for the digging. When capital began to be invested in such workings, and rights of property were created, the disadvantages of a No Man's Land soon became apparent. There were no laws to observe, and there were no taxes to pay; but, on the other hand, there was no security for investment. Who was to say whether the mining company which dug out the coal from a Spitsbergen hill and shipped it to Europe had any legal right to do so, or any grievance against rivals who encroached on its workings and used its machinery? The British Government, with their accustomed modesty, had proposed an international arrangement before the war. But a conference held at Copenhagen with that end in view failed because Germany, as usual, made untenable demands and would not compromise. Of all the Northern Powers, Germany had the least interest in Spitsbergen, and wanted most. Acting on her own account, she set up a wireless station in the islands, and would have made great use of it during the war if her cruisers had been able to keep the seas. We do not know whether, in fact, this German station in the Arctic was of any service to the U-boats which from time to time harried our munition ships on their way to Archangel; but it might have been employed for that purpose. Finally, in the Treaty of Brest-Litovsk, Germany and the Bolsheviks asserted that they, and they alone, were entitled to settle the fate of No Man's Land, without regard to the other nations interested. Germany wanted a place in the Midnight Sun, and Lenin perhaps desired a new penal settlement for the Socialists who had the bad taste to disagree with him. This impudent claim showed that the question of Spitsbergen could no longer be allowed to remain open. We have decided it by annexing the southern portion of the islands containing the chief mineral deposits, and the most resolute opponents of annexations will find it hard to raise an objection.

The truth is that, by right of settlement and by virtue of possession in due legal form, Spitsbergen became a British Dependency three centuries ago. The islands were first discovered in 1596 by the Dutch skipper Willem Barents, who named them from their pointed hills, but they were first turned to account in a commercial sense by Henry Hudson in 1607, and they were annexed in 1614, when Baffin and Fotherby solemnly took possession of "King James his New-land." The early history of Spitsbergen, so admirably recounted by Sir Martin Conway in his "No Man's Land," resembles that of Newfoundland, which was originally a fishing station common to the hardy adventurers of all nations, then came under our naval jurisdiction, and finally developed into a Colony. For sixty years the parallel held good. The Muscovy Company, one of whose leading members was that John Tradescant whose collections formed the nucleus of the Ashmolean Museum, sent fishing fleets annually to the Arctic, and amassed much wealth, despite the rivalry of the Dutch, the Danes, the Basques, the French, and the troublesome "interlopers" from Yarmouth and Hull who would not recognize the London monopoly. The Greenland Company, so called because Spitsbergen was thought to be a part of Greenland, continued the work through the Commonwealth period and after the Restoration. Whales in those days were innocent enough to come in shoals into the Spitsbergen bays where the fishermen awaited them. When the whales were killed, by arts which the Basques taught to Northern Europe, the blubber was taken ashore and boiled down in great coppers, and the oil was put into barrels for export. Permanent buildings were erected on the inhospitable shores, including workshops, storehouses, and dwellings for the men. The English whalers, fearful of making the whales shy, dispersed their settlements round the southern coast. The Dutch, on the other hand, concentrated their business at an island off the northwestern corner of Spitsbergen, where a little city, called Smeerenburg or "Blubber Town," came into existence after 1617. In its palmy days, about 1630, Smeerenburg was a hive of industry, in which each of the chief Dutch ports had its own ships, its "cookery," and its warehouse and coopery, while there was a church and there was also a fort to defend the settlement. Fired by the exmple of some Englishmen who unwillingly spent the winter of 1630–31 in Spitsbergen—after some criminals had vainly been offered a reprieve from hanging if they would do so—the Dutch tried the experiment with success three years later; but they repeated it once too often, as the unlucky men left to hold the fort were found dead of scurvy. Smeerenburg was too successful to last. The whales after a time declined to come and be killed in such a busy port. The Dutch then took to hunting them in the open sea, without bringing the carcases to shore, and gradually deserted the station. The more prudent English whalers in the south of Spitsbergen found, for a time, that the whales still came into their quiet bays, but after the Restoration the operations of the Dutch fleets in the neighboring seas gradually drove all the whales away. From about 1670 the English whalers ceased to frequent their old haunts, and Spitsbergen, unlike Newfoundland, relapsed into obscurity. A hundred years later, the Admiralty, opening a new era in Arctic exploration, sent Captain Phipps to Spitsbergen on the voyage in which the boy Nelson had his famous encounter with a Polar bear.

It is strange to think of war in connection with these Arctic islands. But the rival whalers were, from the first, only too ready to fight, and the Muscovy Company's men sometimes found their own countrymen from Hull and Yarmouth as formidable opponents as the Dutch. Our early fleets were well guarded by warships, which drove the Dutch off; but when the Stuart Navy became derelict the Dutch repaid the compliment with interest. In 1618, for example, a Dutch squadron attacked our whalers and inflicted great damage; for which, as for massacre at Amboyna, no reparation was made. Dutch jurists, like the modern Germans, talked much about "the freedom of the seas," but interpreted the phrase in their own interests. These outrages ceased in Cromwell's day, and at a later date the Dutch found themselves harried by powerful French squadrons, which went to the Arctic for the purpose of destroying the Dutch whaling industry. But Europe's need for whale-oil in the seventeenth century was so insistent that the hardy seamen were prepared to fight for it as well as to brave all the dangers of the seas. Sir Martin Conway points out that the modern world, having passed through the Reformation, was crying out for more soap—another illustration of the maxim that cleanliness comes next to godliness—and train-oil was the material which the soap-makers required. He hazards the curious suggestion that it was the greatly increased supply of good soap, from Spitsbergen whales, that led to the popularity of lace and linen and great starched ruffs in the costumes of the Stuart period. But for the discovery of Spitsbergen, our ancestors and ancestresses could not have indulged in such a luxury of fine washable materials as we see in the portraits of Hals and Van Dyck. We now look to the tropics rather than to the Poles for soap-making materials; but Spitsbergen, with its vast deposits of coal and iron ore, has again become necessary to the world. That being the case, it is well that its international status should be clearly defined, so that Spitsbergen may not again become a cause of quarrel, as it was three centuries ago. Our title may be somewhat faded, but on the principle ***Nullum tempus occurrit regi***—which we may interpret as "The lapse of time does not invalidate the King's right to anything"—Great Britain's claim to Spitsbergen is certainly superior to that of any other State.

BOOK REVIEWS.

Faris, John T. *The Romance of Old Philadelphia.* Pp. 336. Illustrated. Philadelphia, J. B. Lippincott Company. 1918. $4.50 net.

This handsome book is a companion to "Old Roads Out of Philadelphia," recently reviewed in the BULLETIN. It contains a wealth of material on bygone customs and occurrences. There are interesting side lights on famous persons and places. From the manuscripts and other records in the Historical Society of Pennsylvania, from the files of the *Pennsylvania Historical Magazine,* and from original sources, Dr. Faris has gathered main portions of the book. Much of it is, therefore, new and fresh. No one can read the volume without interest and profit, or can fail to admire the fine illustrations.

The word "Romance" in the title, however, seems inappropriate when applied to this scrapbook of quaint and curious items. Ordinarily the term connotes a degree of personality and an amount of extraordinary adventure which is absent in many of Dr. Faris's excerpts. Romance may lurk in a list of Philadelphia exports, a doctor's bill, a stone mason's advertisement, a school law, a funeral notice, a recipe for dyeing, or in Fulton's canal calculations; but we wish the author to bring for us the gold out of the clay. To somewhat baldly present these things without clearly bodying forth the romance to which they contribute is to omit one's duty or to admit that it cannot be done.

"Old Roads" necessarily demanded the collection of many diverse facts which were held together by a very slight thread. It was a guidebook, and its loose organization was abundantly justified. In the present volume, however, the author has almost as loose a treatment, with confusing results. The reader will probably lay down the book with gratitude to the writer for presenting so much of interest, but also with a strong feeling that he has been examining a storehouse, not a structure. It is the materials of history which are here presented, not history itself.

Although of the accuracy of most of the statements there can be no doubt, two comments must be made. First, it is scarcely historically accurate to give in the preface such a strong impression of Philadelphia as a city which illustrates pioneer life. Philadelphia does not typify life "daringly used and cheerfully hazarded," and Dr. Faris's material does not give the impression which the first two pages of his preface induce. The city really stands as a type of the progress of American civilization during the two centuries and a quarter following 1683. The surprising thing about Philadelphia was the rapid discarding, from an American point of view, of any pioneer aspect. In the second place, we note that while the preface is dated August, 1918, the author had evidently failed to consult Dr. McMaster's two large volumes on Stephen Girard, previously published also by the Lippincott Company. Had he done so, the version of Girard's arrival in Philadelphia would probably have been changed.

Taking the book for what it is, however, not for what is may purport to be, the amount of information and of entertainment which it conveys is great. No Philadelphian who counts himself interested in his city's history can afford to neglect such a contribution.

WALTER LEFFERTS.

Cooke, Morris Llewellyn. *Our Cities Awake.* New York, Doubleday, Page & Co., 1918. Price $2.50.

In this excellent summary of his experience as Director of Public Works in Philadelphia under Mayor Blankenburg, and of the convictions which that experience forced upon him, Mr. Cooke has stated definitely and in great detail the underlying causes of the failure of virtually all the great cities of the country to make of municipal government anything but a scandal, and prescribing with equal explicitness the remedy for this disgraceful state of affairs. The author cites from the experience of the cities from whom we have most to learn, many illuminating examples of right methods of handling the numerous and complicated problems which have to be faced in the attempt to administer honestly and efficiently a long array of practical duties ranging all the way from the disposition of the city's waste to such spiritual aims as popular pageantry and municipal music, and he shows convincingly enough what kind of city charter and what form of city government offer grounds for reasonable expectations of the realizations of these ideals. This means, of course, that the author is a warm advocate of the Commission-manager system, a small commission at that—and realizes, as everyone must realize who devotes any serious study to the problems involved, the futility of attempts to reconcile the aims of any genuine reforms in civic administration with the absurd and long-ago-discredited system of municipal government by legislative bodies elected by districts. This method implies, in fact, a whole outfit of political machinery inextricably involved with partisan politics, which have no more to do with the business of running a city than operating the Panama Canal has to do with the mountains of the moon.

It is a pity that one who finds so much to approve in Mr. Cooke's book cannot share more fully his optimistic views of present tendencies. He prints, it is true, an honor roll of the cities which have adopted the enlightened policy which the Commission-manager idea represents, but they are all names of small cities; not a single one of the great cities is included, and one cannot resist the temptation to suggest that the single criticism that the work invites is concerned with its title. Are our cities—the great ones at least—really awake? or are they still asleep—over a volcano, perhaps, but still sound asleep?

L. W. M.

Rinehart, Mary Roberts. *Tenting To-night.* Illustrated. Pp. 188. Boston and New York, Houghton, Mifflin Co., 1918. Price $1.75.

Whatever Mrs. Rinehart writes, and under whatever circumstances it may be written, it is always worth reading. In this book, as in two others, she has done a difficult thing extremely well. She has portrayed the delights of Glacier Park in a form that, besides being pure literature of a high order, will at the same time lure many a nature lover and many of her own disciples to the Park. All effort to give publicity to the Park is so delightfully camouflaged under a variegated cloak of brilliant description, quaint and delicate humor, and sheer joy in nature, that any who are led by her book to seek the same pleasures in the same beautiful region, will recognize the source of the impulse but never its intent. In all this Mrs. Rinehart has brilliantly eclipsed Mrs. Humphry Ward, who, it may be recalled, essayed a like task some years ago for the then most famous sections of the Canadian Rockies. But "Tenting To-night" will live as an integral part of the vivid literature of the wild, while "Lady Merton, Colonist," will ever be a source of regret, if not to its distinguished authoress, at least to friends jealous of her literary fame.

Miller, Warren H. *Camping Out.* Pp. vii–322. New York, George H. Doran Co., 1918. Price $1.50.

When one goes a-camping, the all important thing is to forget nothing. And Mr. Miller, in taking his readers a-camping, has forgotten to tell them nothing that they should know. Mr. Miller has camped for thirty years—exactly the same number as the present reviewer—and after that experience, no little original dodges and devices that make for comfort for that particular camper are likely to have remained undiscovered; and Mr. Miller generously lets his readers into all these pet secrets. The wilderness camper by canoe, horse or hike, may be sure that if he knows and practices what this book preaches, he will always camp in absolute comfort. And if he is lucky and resourceful enough to hit upon a few additional devices of his own, he will camp in bliss. The reviewer has himself chanced upon a few of these that he fondly believed were original, but Mr. Miller's book has sadly reduced the number of them.

Sweetser, M. F. *A Guide to the White Mountains.* Pp. 387, with six panoramas and a map. Boston and New York, Houghton, Mifflin Company. Price $2.75.

With a wealth of data, laboriously collected, carefully indexed and recently revised, this pocket volume admirably serves the double purpose of creating and satisfying interest in the region which it covers. Its well-worded scenic descriptions, its citations from Indian lore and early history and its brief references to geologic formations and varieties of plant and tree life create a powerful desire to substitute the peace and purity of the mountains for the strain and uncleanness of the city. Its minutely accurate word pictures of the views from all the well-known peaks, aided by excellent drawings of the panoramas from six of the more important, offer great aid to the traveler in deciding where to go by telling him exactly what he will see upon arrival.

In the matter of those practical details of vital importance to the tramper and climber, the book contents itself with a few suggestions and warnings and a generous reference to the invaluable Appalachian Mountain Club "Guide to Paths in the White Mountains and Adjacent Regions."

These two works (supplementing each other to perfection) form together the best introduction, of which I know, to a country of unlimited enjoyment.

Allen, Edward F. *A Guide to the National Parks of America.* New York, Robert McBride & Co., 1918. Price $1.25.

A neat and compact little volume, which contains full descriptions of the National Parks, Reservations and Monuments of America, including the United States and Dominion of Canada, and gives practical hints and information as to hotels, guides, transportation, etc., for the benefit of tourists, campers and climbers.

The magnificence of American scenery is dilated upon in such manner as to emphasize its fascination to those readers who are familiar with our National Parks, and to stimulate the interest of others who have not yet fallen under the spell of the wonders of Nature in her many aspects, found in different sections of our country.

L. B.

GEOGRAPHIC NEWS AND NOTES.

Making Army Maps.—The topographical division must be able to furnish at quick notice maps of enemy ground and also that occupied by our own troops, the latter including not only the advance areas but also the territory in the rear. Obviously, it would be difficult, if not impossible, for a single detached organization to do the field and air work necessary for the production of all of these maps, especially on an extended front. The plan is, therefore, to have each army map the territory along its own front, while the topographical division of the intelligence section, a headquarters unit, acts as the general clearing house for map questions of policy by which the special map-making forces in each army are guided. Its work involves, of course, very close coöperation with the air service.

The work divided into three phases, the taking of the picture, its interpretation after development and reconstruction of the data in map form. Our topographical division has developed a force of specially trained men for the last two steps of this work, which calls for the highest type of technical skill, long experience and thorough familiarity with almost everything connected with modern warfare. To the uninitiated some of these pictures would be absolutely meaningless. Often the exposures are made at great heights, when machines are forced upward by anti-aircraft fire; conditions of light may be poor; the machine not be flying horizontally when the exposure is made, causing distortion in distances. In fact, scores of variable factors enter into the work, and the interpreter of photographs taken in the air must be a man of seasoned judgment, able to evaluate each streak or spot and discover its true meaning. His work is made doubly difficult by attempts to camouflage the positions of enemy guns. The photograph reader, therefore, must be a student of camouflage in all of its many variations.

After a picture is made no attempt is made to enlarge or reduce it to some uniform scale. It is put under lenses of high power, as well as stereoscopes, which bring the details out in relief, and the man who reads the passage must be able to make the proper allowances for the height at which the exposure was made. The usual height for taking a picture from an airplane for map-making purposes, I was told, is 2,500 meters.—Robert K. Tomlin, Jr., in the *Engineering News-Record.*

Major Lawrence Martin, who is chief of the Geographical Section, Military Intelligence Division of the General Staff, served at the front with American, British, French and Italian troops and is now on duty in Paris with the American Commission to Negotiate Peace.

We learn from *The American Museum Journal* that the second Asiatic Zoölogical Expedition of the American Museum of Natural History under Mr. Roy C. Andrews, sailed from the United States in June, 1918. At present Mr. Andrews is in Peking and proposes as soon as the spring weather arrives, to proceed to Urga in northern Mongolia. Here he will establish his base camp, near the junction of two life zones, the Siberian and Mongolian and the Central Asian. After a four month's stay in northern Mongolia, Mr. Andrews hopes to hunt big-horn sheep along the Chino-Mongolian frontier. The species of mountain sheep here found is large, with horns measuring sixty inches. The expedition expects to return to New York some time in February, 1920.

Captain William Curtis Farabee, on leave from the University of Pennsylvania, is attached to the Intelligence Service of the Army and is now on duty in Paris.

Major Alfred M. Collins, who served as an ordnance officer with the American, British and French forces in northern France, has returned to Philadelphia.

Mr. Herbert L. Bridgman, of Brooklyn, a corresponding member of this society, has been elected an honorary fellow of the American Museum of Natural History in recognition of his valuable assistance in furthering the Peary and other Arctic expeditions and his contribution to the advancement of scientific travel through his writings in the public press.

The death is announced of Mr. Theodoor de Booy at Yonkers, N. Y., on February 18 at the early age of 36. Mr. de Booy was the joint author of the recent work "The Virgin Islands," and was well known for his archæological investigations in the West Indies.

Dr. G. Grandidier has been elected secretary of the French Geographical Society to fill the vacancy caused by the death of Baron Hulot.

ACTIVITIES OF THE SOCIETY.

ITALY AND ALBANIA AT WAR.

BY PROFESSOR CHARLES UPSON CLARK.

The second lecture of the season in Witherspoon Hall on December 4, was devoted to a further exposition of Italy's part in the war by Professor Charles Upson Clark, of the American Academy in Rome. The later phases of the campaign, including the final successful offensive of General Diaz's army, were described and fully illustrated with motion pictures and lantern slides.

AMERICAN BIRDS.

BY MR. NORMAN M'CLINTOCK.

On the evening of Wednesday, January 8, an interested audience listened to Mr. Norman McClintock, of Pittsburgh, who described his adventures with home birds and with those of our southern states. Exceptional interest attended the display of motion pictures depicting birds in their natural habitat, obtained by means of a motion picture camera with a telephoto lens attachment.

ANNUAL DINNER.

After an interval extending over several years, the custom of holding an annual dinner was resumed on the evening of Friday, January 24, when some 180 members and guests attended the dinner served in the Clover Room of the Bellevue-Stratford. An international flavor characterized the postprandial addresses, which related to the territorial claims and national aspirations of

Belgium, France, Italy and Armenia—claims which are now receiving attention at the Peace Conference. The allies mentioned were represented respectively by: Mr. Robert Silvercruys, Capt. Delport, Lieut. Giorgio Abetti, R.I.A., and Mrs. Bertha S. Pappazion. Sir Geoffry Butler was prevented at the last minute by official obligations from representing Great Britain.

As a climax to the evening enjoyment, the Elisha Kent Kane Medal of the Society was presented to Mr. Vilhjalmur Stefansson, leader of the Canadian Arctic Expedition. Preceding the bestowal of the medal, Vice-President Bryant pronounced a brief appreciation of the services of the guest of honor, following which President Lingelbach handed him the medal. After expressing appreciation of the honor conferred, Mr. Stefansson entertained the assembled company with reminiscences of Arctic travel and a statement of some of the economic possibilities of subarctic Canada, especially in connection with the domestication of the musk ox.

VICTORY AND BEYOND.

BY MAJOR IAN HAY BEITH.

On Wednesday evening, February 5, a large audience greeted Major Beith, the well-known author, who charmed his hearers with an account of his experiences with the American Army in France, and observations on the future of Anglo-American solidarity.

ACCESSIONS TO THE LIBRARY.

Beebe, William. *Jungle Peace.*[1] Pp. 297. Illustrated. New York, Henry Holt & Co. 1918. Price $1.75.

Boerker, Richard H. D. *Our National Forests.*[1] Pp. 238. Illustrated. New York, The Macmillan Co. 1918. Price $2.50.

Cooke, Morris L. *Our Cities Awake.*[1] Pp. 351. New York, Doubleday, Page & Co. 1918. Price $2.50. (See review.)

Howe, Wm. S. *War and Progress.* Pp. 136. Boston, LeRoy Phillips. 1918. Price $1.00 net.

Hudson, W. H. *Far Away and Long Ago.*[1] Pp. 332. New York, E. P. Dutton & Co. 1918. Price $2.50 net.

Miller, Warren H. *Camping Out.*[1] Pp. 322. Illustrated. New York, George H. Dornan Co. 1918. Price $1.50 (See review.)

Rinehart, Mary Roberts. *Tenting To-night.*[1] Pp. 188. Boston and New York, Houghton, Mifflin Co. 1918. Price $1.75. (See review.)

Saunders, Charles F. *Finding the Worth While in the Southwest.*[1] Pp. 231. New York, Robt. M. McBride & Co. 1918. Price $1.25.

[1] Obtained through membership in the Associated Mountaineering Clubs.

St. John, Larry. *Practical Bait Casting.*[1] Pp. 181. New York, The Macmillan Co. 1918. Price $1.00.

Seton, Ernest Thompson. *Sign Talk.*[1] Pp. 232. Illustrated. New York, Doubleday, Page & Co. 1918. Price $3.00 net.

Jastrow, Morris. *The Bagdad Railway.* Pp. 160, with map. Philadelphia, J. B. Lippincott Co. 1918. Price $1.50.

DeBooy, Theodoor, and Faris, John T. *The Virgin Islands: Our New Possessions.* Pp. 292. Illustrated. Philadelphia, J. B. Lippincott Co. 1918. Price $3.00.

Miller, Leo E. *In the Wilds of South America.*[1] Pp. 424. Illustrated. New York, Charles Scribner's Sons. 1918. Price $4.50.

Geographical Society of Philadelphia

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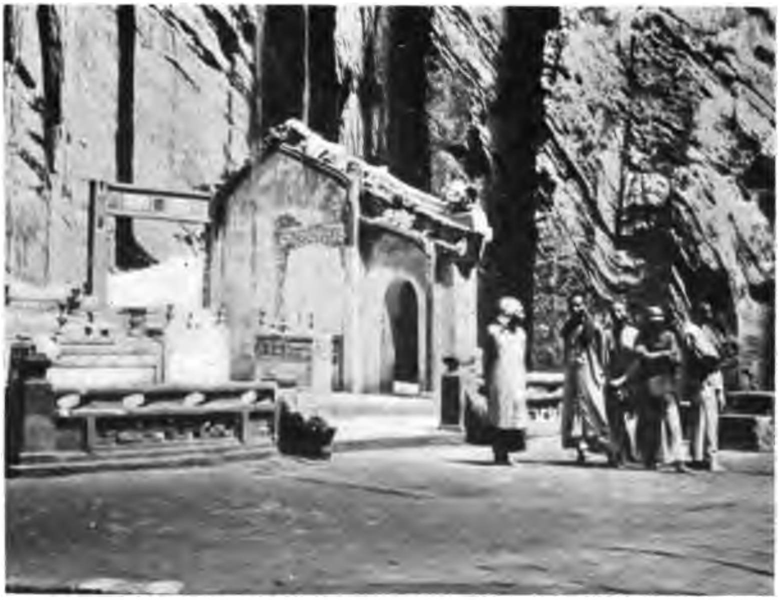
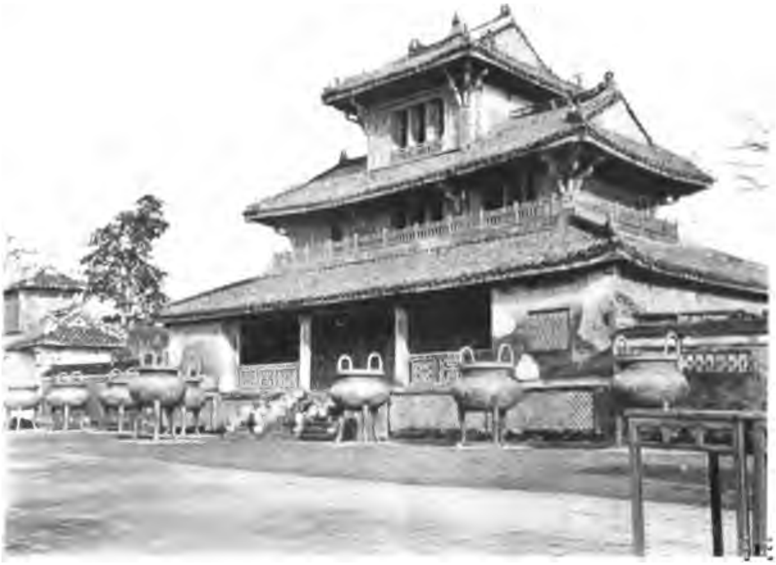
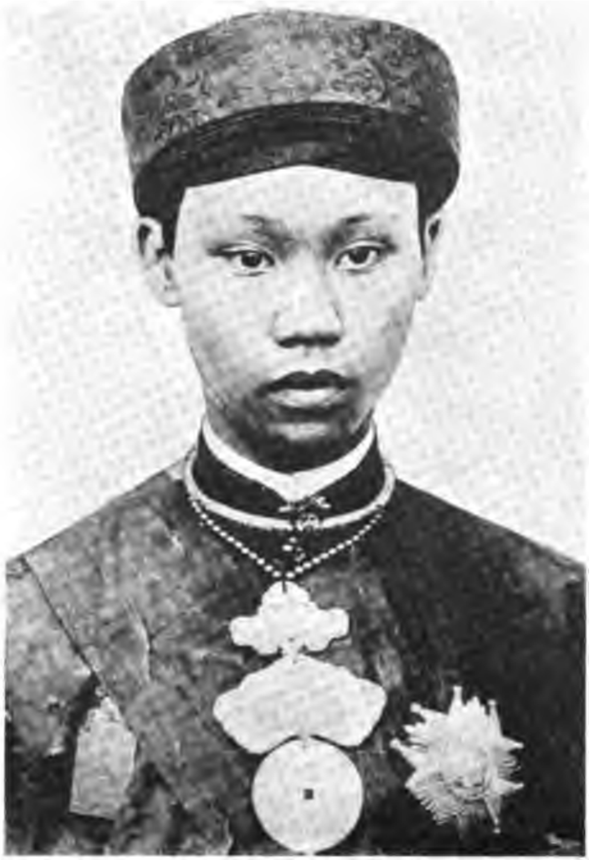


Interior of Rock Temple near Tourane.



Rear of Audience Hall, King's Palace, Hué.

Golden Tiger, Palace Grounds, Hué.



Thanh Thai, former King of Annam, deposed for cruelties to the women of his household.

THE LAND OF THE GOLDEN DRAGON.

RECOLLECTIONS OF FRENCH INDO-CHINA.

HENRY G. BRYANT.

That far-traveling Venetian, Marco Polo, was probably the first European to visit that part of southeastern Asia now known as French Indo-China. The brief and rather vague description of the country given by this medieval writer differs only in degree from many later accounts of this region, concerning which so little real knowledge obtains outside of French sources.

Briefly, the area in question comprises the colony of Cochin China and the protectorates of Tongking, Annam, Cambodia, and Laos; and Kwag-Chau-Wan leased from China. This extensive colonial empire lies south of China proper, and its eastern and southern coasts are washed by the waters of the China Sea, over which sweep the northeast monsoon in winter, while occasional typhoons lend zest to coastal traffic during the summer months. The Mekong River separates Indo-China from Siam on the west.

For centuries the native rulers recognized the nominal suzerainty of China, whence were derived, also, the arts, language, and religion of the Annamites. As early as the seventeenth century, French missionaries established themselves in Annam, emulating the devotion of their coreligionists in Canada in proselyting the natives and extending the political influence of their country. The later persecution of the Roman Catholic missionaries, about the middle of the last century, resulted in the sending, in 1857, of a punitive expedition to Cochin China, and to the eventual occupation of the region about Saigon in 1861–'62. About the same time, France established a protectorate over the neighboring kingdom of Cambodia. In 1882 the Republic initiated an aggressive colonial policy, which resulted in the complete subjugation, by 1884, of all the territory which is now comprised within the limits of French Indo-China.

So much by the way of preface to these discursive notes of a

Journey made in the spring of 1907 in portions of these distant dependencies of France.

After repeated sojourns at Singapore, even the glamor of the cosmopolitan crowds of that great seaport and the exotic gayety of Raffles' Hotel pall on one, and it was with feelings of relief that our little company boarded the Messagaries Maratimes S. S. *Ernest Simon* en route for Saigon. Our vessel was filled with French officers and colonial officials; but, in spite of crowded quarters, the two days at sea passed pleasantly, and each mile of the 648 we traversed brought cooler airs and escape from the relaxing climate of the Straits Settlement. At length *Cap Saint-Jacques,* on a slight elevation at the mouth of the Donnai River, with its conspicuous light-house, looms up ahead, shimmering in noonday heat. The steamer delays long enough to take on a pilot, and we learn that this considerable town is the favorite seaside resort of the European residents of Saigon. For over two hours we slowly ascend the Donnai, which enters the sea by many channels. With frequent capricious turns, we advance past miles of mangrove swamps through a tropical wilderness. In truth, a cheerless introduction, this, to one of France's most fertile colonies. But soon the spires of a cathedral appear, and the presence of several cruisers and torpedo boats remind us that Saigon is the chief naval station on this coast.

This city was formerly the capital and residence of the Governor General of Indo-China, and still disputes with Hanoi, the present capital, for supremacy as the most attractive town in the region. What a relief it was to change from the crowded steamer to the spacious hotel, and to stroll about the shaded, well-paved streets. Here one finds reproduced all the characteristics of a well-administered city in the motherland: broad avenues and parks, an imposing *"theatre municipale,"* statues of French worthies, a military band playing, groups of officers and well-gowned ladies sipping cool drinks at the cafés—all of which recall the Riviera, and the illusion is only dispelled by the presence of groups of natives with nondescript clothes and odd hats. These Annamites are neither Malay, Hindu, nor entirely Chinese in appearance, and we learn they belong to a family group by themselves. Although lacking the vigor and frugality of the Chinese, they are industrious and amenable to the influences of Western civilization. Strange to say, on first meeting these people one has some difficulty in distinguishing between the men and the women—a difficulty which arises from sameness of dress and similarity of arranging the hair. This uncertainly soon disappears, however, as one learns to distinguish differences of bearing and physiognomy.

One can journey to the near-by city of Cho-lon by railway, tramcar, or automobile. This chief commercial city of the colony and entrepôt for the rice of the surrounding region has a pronouncedly Chinese aspect from the fact that Celestials compose a large percentage of its population of 168,100 (1915). As elsewhere in the Far East, the Chinese are strongly entrenched in many fields of industrial enterprise. In the important business of hulling the rice, for instance, at the time of our visit, all the mills, with the exception of two in Saigon, were owned by Chinamen. As no less than 2,415,847,357 pounds of this commodity were exported from Cochin China in the first ten months of 1908, and a charge of 50 cents per picul of 133⅓ pounds was incurred for hulling, it is evident that in this industry alone a sum of almost $8,805,761 was diverted from the producers into the hands of the rice monopoly.

In an agricultural sense the low, flat region about Saigon is a veritable garden, as we learned in our excursions in the neighborhood in an up-to-date automobile. When speeding past paddy fields, sugar plantations, and pineapple groves, some idea was obtained of what has been accomplished by drainage canals and dikes in reclaiming large areas from the encroaching sea.

The vessels of the "*annexe*" fleet, in which we journeyed northward, belong as a rule to that antique type of craft which bear, judging by their age, a charmed life; but, aside from the absence of modern accessories, one can enjoy life reasonably on these boats, as the food is well cooked, the service fair, and the officers courteous and attentive. Some time during our second night at sea we passed Cam Ranh Bay, that now famous harbor, where Admiral Rojdestventsky found a secure shelter for his storm-tossed ships during the Russo-Japanese war. Next day we skirted a bleak shore, with many rocky isles and bold headlands confronting a stormy sea. Of interest, also, were the islands near Qui Nhon, as being the homes of colonies of birds related to the swallow family, whose nests are prized by Chinese epicures for soups. Tourane boasts of a fine harbor, and is the port of Hué, the capital of Annam, with which it is connected by a railway. Our vessel anchored in the outer harbor about 8 p. m., in a downpour of rain, and the transfer of passengers and mails was attended with great confusion. More by good luck than management, we reached shore in the overcrowded little tender and proceeded to fortify the inner man with a late dinner at the one primitive hotel which the town possessed. With the bright sunshine of the morrow, however, our surroundings took on a more cheerful aspect, and we were in the humor to enjoy an excursion in a sampan to the *Montagnes de Marbre,* on an island in the harbor.

A sail of an hour and a half brings us to the island, where we land and follow a winding path through a fringe of foliage and thence across an expanse of light gray sand to the base of some rock-hewn steps, which lead aloft to the upper stretches of the mountain. The entire *massif* rises abruptly from the encircling sand-dune, and comprises five hillocks of white calcareous rock, colored gray and red in places, and standing quite apart one from the other.

The Annamites associate each of these elevations with one of the five elements included in their philosophy. Thus we have mountains of metal, of wood, of water, of fire, and of earth. We make our way up the winding steps encircling Thuy-son, the "water mountain," and arrive at a temple commanding a fine view of the harbor and coast. We are welcomed by a priest of Buddha of dignified bearing, and conducted up more steps to a dark recess in the rock wall, which proves to be the entrance to a passage. Arriving at the end of this, we descend a flight of steps and emerge unexpectedly into a lofty and exquisite grotto, or chamber, consecrated to the worship of Buddha. From the floor of oblong proportions, perhaps 40 feet by 30 feet, rises a diminutive brick temple, roofless and partly in ruins, while a number of images of Buddah occupy niches in the walls, which bear numerous inscriptions in Chinese characters. A subdued light enters from two openings in the roof at least 75 feet above the floor, and many trailing roots of a variety of the rubber tree are suspended from above, some of these almost touching the floor. In places great stalagmites occur in the limestone walls, giving a columnar effect, and added to all this are the delicate green, rose, and purple tints of the marble walls. We were quite unprepared for anything so lovely, and perhaps this element of surprise enhanced the air of solemnity which characterizes this ancient rock temple. It is related that a French naval officer who visited Tourane in 1831 was the first European to view these sacred precincts, having been guided to the spot by a Mandarin of Tourane. The Annamite government resented this intrusion of a "foreign devil," and punished the obliging Mandarin with degradation and 50 blows of the whip.

There is little to interest the traveler in Tourane, and we determined to push on to Hué, taking advantage of the recent completion of the railway to the capital for this purpose. Not to wholly miss the flavor of more ancient methods of travel, however, we left the railway a few miles outside of Tourane and crossed the mountainous peninsula north of the city by means of *pouse pouse* (jinrikishas), on the fine military road which leads over the Pass of the Clouds (Col des Nuages) to Lang-co, on the railway. With three coolies for each passenger, good time was made, and the summit was reached in about two hours. An extensive view rewards the toilsome ascent, the Bay of Tourane and the marble mountains extending to the south. While the coolies were resting, I walked beneath an ancient stone gateway which marks the crest and came directly to the beginning of the steeper southern descent. Here one notes the richer foliage of the southern slopes of the mountain and beholds the white line of surf dashing on the rocks apparently at one's very feet, the whole scene recalling a similar view from the Baidar Gate in the Crimea. The mixed train we boarded at Lang-co occupied six hours in covering the 54 miles to Hué. This easy speed gave ample time to study the country and the groups of curious natives at the stations, not yet accustomed to the railway, opened for traffic only three weeks before our arrival.

Hué itself proved to be full of interest, with a picturesque waterfront extending along the left bank of the Huong-giang. The fortified portion contains the government offices, occupied by the higher native officials. The brick wall—with several gates in the Chinese style—which surrounds the fortified city was built by French engineers, in the service of the King of Annam, about the end of the eighteenth century. The moat which extends in front of this is crossed by several bridges.

The French, who have exercised a protectorate over the country since 1883, find it expedient to administer the laws and collect the internal taxes through native officials. Thus the young King, who was placed on the throne in 1885 after the abortive insurrection of his predecessor, maintained all the outward show of royalty at the time of our visit, notwithstanding that all real power rested with the *résident supérieur,* whose official residence stands on the bank of the river opposite the royal domain. An elaborate native bureaucracy, modeled after the Chinese system, administers the internal affairs of the government; but that an enlightened, modern spirit dominates the situation must be evident when we recall that French troops occupy part of the citadel, and that a French officer commands the bodyguard of the King. The French officials received us with characteristic courtesy and extended facilities for visiting the royal palace and tombs of the kings in the environs of the city. On our first visit to the palace a handsome young Frenchman, the chief of the royal guard, met us at the entrance and conducted us about the place. The enclosure is surrounded by walls five and a half miles in extent, and no less than 1,000 persons reside within the palace grounds.

After crossing the moat and passing under an arch, one comes to an open paved space, from which rises a lofty gateway with three entrances. Surmounting this gateway are bell turrets covered with red and yellow tiles. Passing under this gateway and crossing another moat, we gain an extensive terrace and soon reach the grand court, which contains the throne-room.

In common with other oriental palaces, this one belongs to that elaborate pavilion style of architecture which so well meets the requirements of a tropical climate. The triple roof, with Chinese ornamentation, is supported by massive columns finished in red and gold lacquer and richly carved. Backed by these columns and facing an open area with two terracas, is the golden chair on a pedestal, which serves as a throne. The outlook across the court, with a pine-covered hill in the middle distance, is charming. When the great functions of the court are held here, the mandarins take their places according to the rules of a rigid etiquette. Officials belonging to the three highest grades arrange themselves according to precedence on the upper terrace, while those belonging to the five lower divisions occupy the lower one.

A number of yonug mandarins who belonged to the corps of interpreters accompanied us in making the rounds of the palace. Foreign visitors, aside from those of French nationality, must be rare indeed in Annam, judging from the interest aroused by our arrival. These agreeable young men were greatly surprised to find white strangers from the West who spoke a language different from that of their conquerors. Many memorials of the former kings are to be found in this ancient stronghold of their dynasties. Two pagodas, or houses of veneration of deceased sovereigns, contained, among other objects in the Chinese style of art, curious collections of miniature golden trees with ornaments of carved jade and pearl. The groups of old women found here and elsewhere, who act as guardians of royal tombs and keep up the ceremonious rituals required, were distinguished by sorrowful visages wholly in keeping with their melancholy calling. Especially notable, also, were a miniature garden, or rockery, and a number of huge bronze vases belonging to the dynasty of Gia-Long, which stand in the rear of the grand audience hall. A section of the grounds, surrounded by a high wall with a doorway, near which a group of eunuchs were standing, was pointed out as the "woman's prison." Had we known at the time that this enclosure was to be the scene of a series of shocking tragedies, momentous in their outcome, we would surely have given a second glance at those grim walls concealing such terrible secrets.

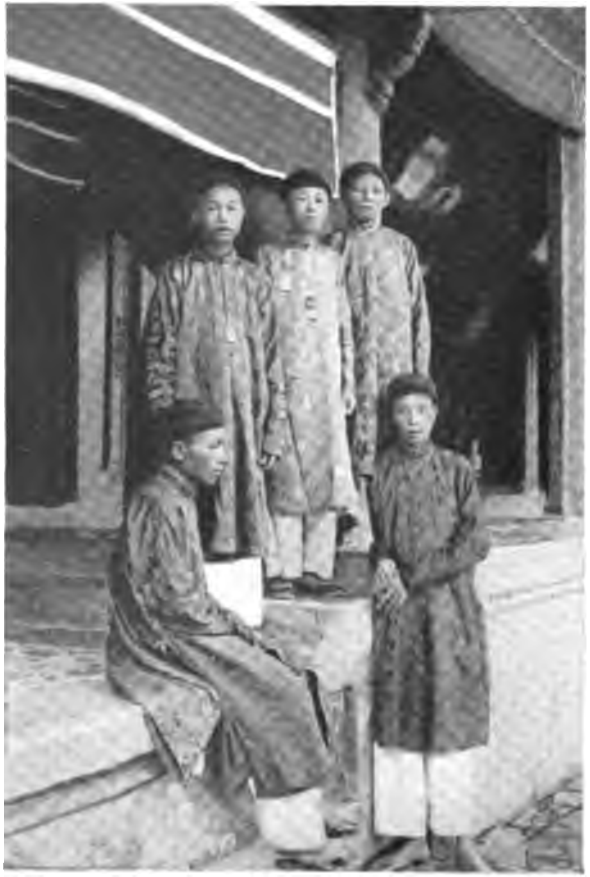
The most interesting excursion from Hué is that to the tombs of the kings. These are all placed near the banks of the river above the city. Permission to inspect these must be obtained from the Minister of Rites, who assigns a mandarin to accompany the visitor. The boat ride up the river in the early morning was delightful, giving us a glimpse of the river traffic, so important in this region of few railroads and many canals. There proved to be a certain sameness about the four mausoleums which are still intact: the approaching avenues lined with trees, the lily ponds, the pagodas rising above the engraved stone describing the virtues of the kings—all these we found duplicated at the various tombs, although the scenic environment in each case added or detracted from the general effect. We decided that King Tu Duc's tomb was the most impressive of all the royal monuments, with its noble trees, romantic pavilions, and terraced court leading to the mortuary shrine. It seems none of these monuments mark the actual resting place of the royal dead, who were always buried in some quiet place near by, to escape possible profanation by their enemies in case of war.

Our most delectable experience in Hué was the audience with King Thanh Thai. Returning to our hotel for luncheon, during the latter part of our stay, we were perturbed by the announcement that an audience had been arranged with His Majesty for three o'clock the same afternoon. The dismay which overtook us arose, not so much from apprehension at meeting so redoubtable a despot at close range, as from a fear that we would not be able to appear in garments compatible with our self-respect and in keeping with the formalities of the occasion. While usage required that the men should appear in evening dress, the exigencies of inland travel had dictated a radical reduction of luggage, and only one of our number was able to support a *costume de rigueur*. Friends helped us out of our predicament in a way, although I fear our makeshift dress would scarcely have passed muster in a court where more rigid regulations prevailed. As it was, we were nearly an hour late in presenting ourselves at the entrance to the palace, where some sentries were on guard, and where a young mandarin met us and led the way to the Hall of Private Audience.

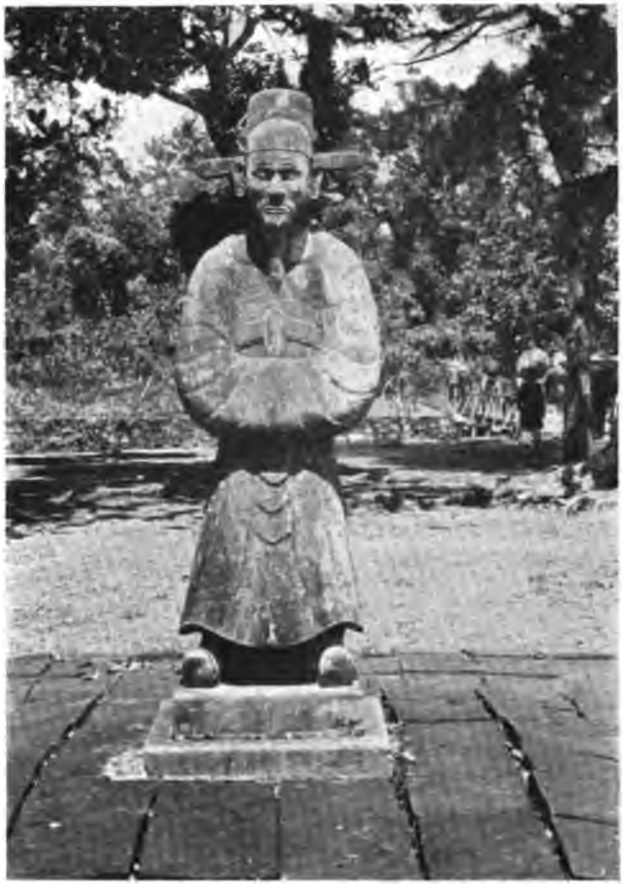
At the entrance to this apartment we came unexpectedly upon the King, who, bowing slightly, saluted us and at once led the way into an inner room, where seats had been arranged in front of a high-backed chair. In the absence of any court functionary, one of our own company then introduced the members of our party to the King, who, after shaking hands, requested us to be seated. The formal conversation had proceeded in French, which His Majesty appeared to understand and speak without difficulty. The King, not wishing to appear at a disadvantage, however, summoned a native interpreter, who spoke French fluently, and this individual acted during the remainder of the interview. No Frenchmen were present, but a number of mandarins were observed hovering about a doorway at the extreme end of the hall. Our host was 28 years

Entrance Gate to Royal Tomb, Hué.

Young Girls of Hanoi. (Note the size of the hats.)



Group of Eunuchs, King's Palace, Hué.



Stone Effigy, near Royal Tomb, Hué.

of age and about five feet seven inches in height, with typical Asiatic features and complexion. His dark eyes had a decided squint, which gave a rather unpleasant expression to his countenance. He wore a jacket of maroon-colored silk, on which was embroidered in gold a design in flowers. On his breast gleamed the insignia of the Legion of Honor and the Annamite order of the Golden Dragon. Under an apparent desire to please, he seemed to suffer from a certain nervousness, which manifested itself in holding the tips of the fingers of the left hand in his right. His Majesty asked what countries we had visited; had we met the kings of these countries? were we pleased with Annam? etc. He announced with some pride that he owned two automobiles, but confessed he was unable to speed them, owing to the crowds attracted when he appeared in the streets of his capital. When the talk turned to tiger shooting his eyes sparkled, and he owned that this was one of his favorite amusements. Presently the King remarked: "I understand the Americans excel other nationalities as inventors; indeed, it has come to my knowledge that one of your countrymen has devised a great gun with which he expects to send projectiles to the moon. What success has rewarded his efforts?" With polite insincerity our courtier-like spokesman assured his questioner that the inventor referred to was still working to perfect his great cannon. The serving of champagne was the only diversion during the interview, which had progressed with signs of intermittent interest on the part of our host. To relieve the situation, after a reasonable time had elapsed, we took the initiative, and, with a proper expression of thanks, shook hands once more and retired from the royal presence. This rather bald recital of a unique experience may seem an ungracious return for hospitality extended; but, in the light of subsequent events, the incident assumed for us a melancholy interest, and is here recorded without prejudice or levity. Tales of incredible cruelties inflicted by the King on the women of his household had appeared in the newspapers before our arrival, and these were confirmed in part by what we learned on the spot. The monarch's excesses became more pronounced later in the year, and he was finally declared insane. The long-suffering Annamites, who regard their King with special veneration, finally became reconciled to his deposition, when it developed that he had murdered seven of his wives in a most inhuman manner, and had actually forced members of his suite, under pain of death, to partake of the flesh of one of them, which he had cooked for the purpose.

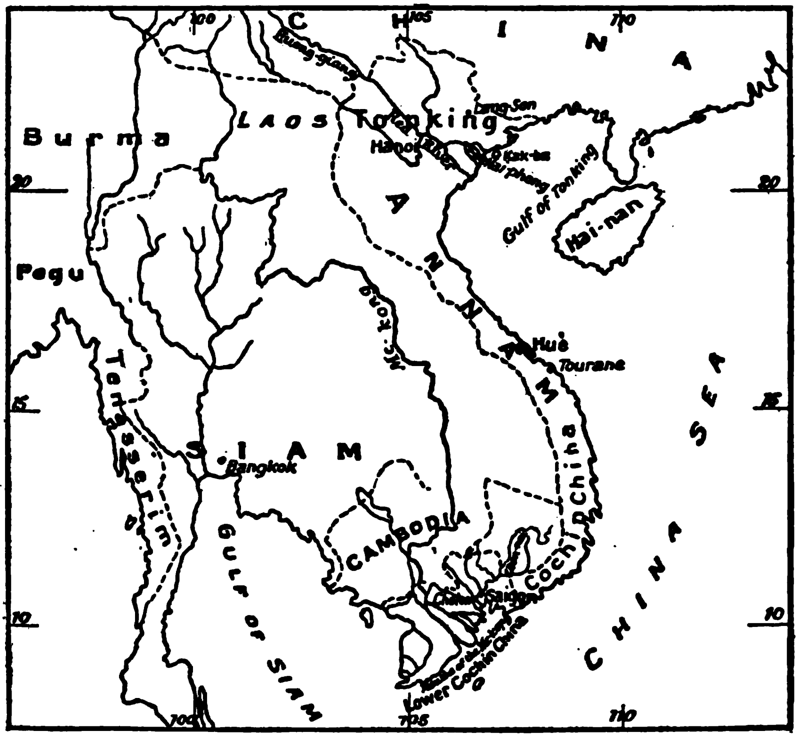
Following the deposition of Thanh Thai, on September 9, 1907, his 8-year-old son, Duy-Tan, was placed on the throne by the French government. The present King, Khai-Dinh succeeded to the throne in 1916.

Fortunately our memories of Annamite princes do not all center about the cruel King. Before leaving Hué, we were entertained one evening at a native feast by one of the royal princes, and the impression left on our minds by this intelligent, unassuming gentleman was most favorable. Subsequently, during our sojourn in Hanoi, we had an interview with the venerable administrator, who is known as Kinn Luoc Hoang Koa-Kai. This official represented the kings of Annam for many years as viceroy in Tongking, and in this instance, also, we were impressed with the natural dignity of the man, aside from any considerations of his rank.

Steamer day found us up at dawn, and, soon after, huddled together on the quay at Tourane awaiting the steam-tender; but we waited in vain, and were finally obliged to impress some sampans in order to board our steamer in the outer harbor.

Annam had treated us well, notwithstanding the wet, cheerless landing and the hurried, undignified departure. We had seen enough to impress us with its great undeveloped resources and the apparent success of the colonial administration. But as pioneer travelers we encountered certain discomforts, not to say hardships, which loom unmistakably in the retrospect of the journey. The total absence of anything in the way of a "traveling public" explained the condition of affairs. Army officers and officials are entertained by their colleagues, and tourists are so rare in this far corner of the East as not to enter into the calculations of the colonials.

This accounts for, but does not excuse, the demoralized chaos which obtained in the hotels of Annam. Indeed, it was a real hardship to the ladies of our party to subject themselves to the shabby vulgarity of the Tourane Hotel, while the sanitary arrangements in vogue at this hostelry would surely have discredited an inn of the Dark Ages. At Hué the hotel itself was more inviting, but the same indifference to the wants of guests was apparent, and one member of our party bewailed the theft of a pair of shoes left in the hall overnight to be cleaned. As the attractions of this portion of Indo-China become better known, and travelers in increasing numbers are drawn to its shores, doubtless these crude conditions will correct themselves; but meantime let not the prospective voyager expect too much in the way of luxury in this portion of the French colonies.



Hai-phong, our next objective point, lies on one of the streams in the eastern part of the delta of the Red River, and is 23 miles from the sea. As the port of Hanoi and the outlet of a considerable river trade, it ranks as the chief commercial city of Tongking. Reclaimed from the marshes, it presents today an object lesson of what can be achieved by engineering skill and liberal expenditure in overcoming great natural obstacles. An extensive drainage canal has accomplished wonders in transforming the port from an unhealthy city to one possessing normal hygienic conditions. From this city, with the Chinese name and European aspect, we started one morning to visit Along Bay, chartering a small steamer for the purpose. A careful scrutiny of the map shows this bay to be situated just east of Hai-phong, in the northern part of the Gulf of Tongking. It is approximately circular in shape, and is about six and a quarter miles in diameter. It is protcted on the south by the considerable island of Kak-ba and on the east by a string of small islets. In romantic scenery, I am inclined to believe this sheet of water deserves the extreme commendation is has received at the hands of French writers, and there is little doubt that it would rank as one of the "show" beauty spots of the East if it were better known. In the retrospect of Indo-China experiences, there is none I recall with as much pleasure as the day spent amid the picturesque surroundings of the Baie d'Along. As our little craft sailed about this secluded bay, it was easy to understand how for hundreds of years it had been the haunt of pirates. Numerous islets of calcareous rock rising from the water assume the most varied shapes; yet all these diversified forms—castles, colonnades, and temples—are covered with a rich growth of shrubs, vines, and orchids, which soften their outlines. The reflections in the aquamarine surface were surprisingly clear, and, to add to our bewilderment, we were told that the tide in the bay is diurnal instead of semi-diurnal, as in most arms of the sea. The bay is a favorite practice ground for the French cruisers, and coal is extensively mined at the near-by mines at Hongay. There are two large caverns on islands in the bay which well repay a visit.

Our most ambitious side trip in Tongking was to Lang Son and the Gate of China, which is just across the border in the Chinese province of Kwang-si. Wishing to see as much of the country as possible, we engaged the same steamer used on Along Bay and made our way from Hai-phong up the Thuong River to a town on the railroad named Phu Lang Tuong. The journey of five hours on the well-constructed railroad took us through a wild and uncultivated region, with occasional stations, where we soon distinguished many strong Chinese types among the more effeminate-looking Annamites.

Lang Son is a strongly fortified town on the left bank of the Ki-kong River, and is the headquarters of one of the military districts. The considerable number of troops stationed in this vicinity explained the importance of the railroad as a military necessity, connecting this important position with the capital. A cold rain made even the shabby little hotel seem comfortable as we toasted our feet at the fire that evening at this farthest outpost of colonial empire. Next morning a short railway journey brought us to Dong Dang, whence we were taken in jinrikishas in about one hour to the actual boundary line, marked by a marble obelisk. A few rods beyond, where a low pass occurs in the rocky defile, a lofty white gateway arched the road. High, rocky ridges sweep up the hillside on both sides of the gateway, and, surmounting these ridges, castellated stone walls and a strong battery frown from the heights 500 feet above.

Not a sound disturbed the stillness, nor was there any sign of life whatever as we approached the "Gate." Entering, we found a sleepy and shabbily dressed Chinese sentinel on duty. Just beyond the first arch, another gateway appeared with a small barrack attached. The only object in sight suggesting twentieth century activities was a diagram posted on the wall, illustrating the different positions assumed by a soldier in the manual of physical exercises. Five hundred yards beyond the wall we arrived at a wretched collection of huts, which may have been a deserted village or disused quarters for troops. Filled with reflections as to the stirring events which may be enacted in this defile, in case another Franco-Chinese war occurs, we returned to the town with the musical name, Dong Dang, and arrived the same evening at Lang Son. Boarding the train the next morning at 6 o'clock, we arrived in less than six hours at Hanoi, the capital of Indo-China.

In addition to its European quarter, the city's population of 150,000 (1915) is made up of an amalgamation of several native communities. After visiting many cities in the Far East, I must affirm Hanoi made a distinctly favorable impression. It is, indeed, a creditable creation of the French colonizing spirit, with its broad avenues, stately government buildings, sunny parks, and good hotel.

These characteristics give to the capital a distinction in addition to that which adheres to it as the hub of French officialdom in the East. Should fate decree that I should be exiled to the French colonies in Asia, Hanoi would be my choice as an abiding place. The intense patriotism which never permits the colonist to forget the motherland or to adapt himself irrevocably to new conditions, has often been urged as one of the factors which make against success in the French colonies. If there is any city among France's colonies where the exile should be reconciled to his lot, that city is Hanoi, with its boulevards and *magasins*, its race-course and subsidized opera, its soldiers and the gay life of the cafés.

Historically, too, the exquisite "Little Lake," which forms so pleasing a feature of the city, is associated with the heroic incident in Annamite history, which recounts how Le Soi, a poor fisherman, in 1418, received a miraculous sword from the *genii* of the lake, and, championing the cause of his countrymen in the war for independence against China, was eventually victorious and founded a dynasty. Nor is the modern city lacking in historical associations; and, wholly aside from the international questions involved in the French intervention in Annam (1858–1883), a romantic page of history will be revealed to those who care to pursue the subject of the conquest of Tongking.

It was disappointing to find so little in the way of native-art products in the French colonies. We looked in vain for any choice examples of modern porcelain or art metal work. In Hanoi, however, there has been a gratifying revival of art embroidery, and also of the manufacture of cabinet-ware inlaid with mother-of-pearl. In the bazaars good specimens of old jewelry may occasionally be secured, and ladies shopping in the native quarter will be tempted to purchase as a souvenir one of the circular hats worn by the Tongkinese belles, which quite outclass in size any creation of the European milliner.

In conclusion, I venture to predict that the legitimate aspiration of France for colonial expansion and for a share in the commercial development of the Far East will eventually reach its fulfillment in the colonies of Indo-China. In their early history the colonies were retarded in their growth by certain conditions inimical to healthy development. Perhaps the most important of these was the absence of agricultural and commercial colonists of the better class. This is still a desideratum which remains to be fully realized. Then, too, the expense of maintaining the large corps of officials and a standing army bore heavily on the finances of the colonies, and for years necessitated the payment of a large yearly grant by the home government.

Signs are not wanting, however, to show that conditions have improved in recent years. For some time past the colonies have been on a self-supporting basis, and considerable numbers of bona fide emigrants are now being attracted to the East. Experience has shown that railroads are great civilizers in all countries, and the actual completion of lines in Indo-China aggregating 993 miles in length (1915) augurs well for the future. The comprehensive reforms introduced by M. Doumer, the energetic Governor General (1897–1902) were unquestionably far-reaching and salutary; and, add to these the fact that in recent years the terms of the governors general have been more extended than formerly, resulting in more settled policies of administration, and we have another factor making for better government.

In the aftermath of the Great War, doubtless one of the factors of allied success inexplicable to the German mind, will be the loyal support rendered to the home-lands by the colonies of the entente nations. With a black record of inefficiency and failure in her own attempts at colonial administration, the spontaneous response of these dependencies to the call of duty must have been an outcome full of significance to the military autocrats. France shared with Great Britain in this happy coöperation, and, in spite of the elaborate and insidious propaganda maintained by the Central Powers, no serious inroads were made on the patriotism of the widely-scattered colonies of the Republic. M. Henry Simon, the Colonial Minister, speaking in the Senate, said, that in July, 1918, the French colonies had supplied the armies with 918,000 men, of whom 680,000 were fighting units and 380,000 workers. To this grand result, the group of colonies we have been considering—French Indo-China—made a most creditable contribution. Without achieving special distinction as fighting forces, these particular colonials nevertheless enacted a useful rôle as "workers" in the great war machine, and, to many American veterans of the war one of the interesting memories of their experience in France will be their contact with these picturesque Annamite helpers from distant Asia.

We learn from a recent *Bulletin of Information* published by the Paris Chamber of Commerce (Oct., 1918), that, in addition to the military aid rendered, Indo-China subscribed liberally through the Indo-Chinese Bank to the various government loans. "As early as 1915, the general estimates for the budget of Indo-China were made to include all expenditures made on behalf of the War Office, amounting to 11,037,000 francs. In September, 1918, M. Albert Sarraut, the Governor General, issued a similar order in regard to all large purchases of alcohol used for powder. Treasury advances to about a hundred million francs, without interest, were made for the expenses of the mother-country in the colony. And lastly, not content with these proofs of loyalty, Indo-China contributed 9,237,787 francs towards relief societies for war victims."

In view of their wealth of natural resources, improved administration and the patriotic rôle they have played in the recent war, the future of the French colonies seems assured, for "instead of being the signal for the splitting up of France's vast over-sea possessions, as the enemy had hoped and expected, the German aggression has only strengthened the ties between the colonies and the homeland, binding them, in the face of one common danger, still more closely together. It has proved too, what a spirit of fairness and liberality, the third Republic has displayed in her work of colonization, and . . . it will not be one of the least weighty consequences of the war, for France, to have been made to realize more fully the store of strength and vitality in reserve for her, in the large populations and immense wealth of her colonial empire."

SLOPE EXPOSURE AND THE DISTRIBUTION OF PLANTS IN EASTERN PENNSYLVANIA.

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INTRODUCTION.

Considerable attention has been paid by plant geographers to the influence of the physiography of a country on the distribution of the plant life. The physiographic elements, which must be considered in a discussion of the habitats of land plants, are altitude above sealevel, exposure, slope, surface features and topography. European botanists have led in the investigation of the influence of slope exposure on the distribution and successional changes of the vegetation of Eurasia. The direction and height of mountain chains have important climatic significance. The Blue Mountains of Jamaica, for example, rise in Blue Mountain to an elevation of about 8,000 feet. The north slopes of this range are covered with a dense, tropical, rain forest, while the south slopes are more arid until in the Liguanea Plain we find actual desert conditions to exist. In like manner, the coast mountains of Brazil are rainy and forest clad, but the interior is dry, because the moisture of the trade wind is condensed before the interior is reached. The steepness of the slope, that is the angle of inclination, decides whether the soil will be stable, or tend to slide down the mountain sides. The drainage of such steep slopes and the stability of the soil masses has an important influence on plant life. The exposure of slope is determined by its direction with reference to the cardinal points of the compass. We, therefore, have north-facing, south-facing, east-facing and west-facing slopes. These are variously exposed to the sun and prevailing winds and these are important factors in determining the kind of vegetation which clothes the inclined faces of the hills, or mountain ranges. Giltay has made some observations, showing the differences that can exist in temperature and atmosphere humidity only a few paces apart on the northern and southern slopes of sand dunes in Holland. The chain of the Alps present numerous illustrations of the prevailing Mediterranean flora on the south side (transalpine) of main ranges, while the flora of the north (cisalpine) slopes is quite different. Differences in the geognostic structure, for example, the inclination of the strata have a marked influence on the character of the vegetation, as demonstrated by Woodhead and W. G. Smith in England, and Flahault in France.

The botanists of America have not been backward in this investigation and the western botanists have taken the lead, because the influence of slope exposure is more definite and striking in the Rocky Mountains, Sierra Nevada and Coast ranges than in the mountains of the east, which are much lower and more uniform in their climatic peculiarities. Ramaley,[1] writing of the plants of the mesas in Colorado, east of the divide, states that "the vegetation on the north slopes of the mesas differs, more or less markedly, from that of the south slopes. The varying amount of moisture and sunshine are the important factors in determining this difference. The east and west ends of the mesas are also different in their plants. The west end being closer to the foothills is sheltered from the afternoon sun, while the east end is not thus protected. In spring, small streams from the melting snow on the hills water the west end of the mesa. The snow also lies lower there. Pine trees and quaking aspens grow there, while at the east end there are no trees at all." Spalding and Blumer, who have collected the desert lichens near the Desert Botanical Laboratory at Tucson, Arizona, have noted that the lichens are very scarce on southward-facing rocks, their place of best development being the northerly faces of basaltic rocks, where the conditions are comparatively moist and cool.[2] Shreve[3] has demonstrated for the Santa Catalina Mountains of Arizona that "the direction of slope of a particular habitat is of prime importance in determining the precise character of its plant covering. The differences between the vegetation of a north-facing and a south-facing slope at the same altitude is roughly equal to the difference between two south-facing slopes which are 1,000 vertical feet (305 m.) apart." The vegetation and flora of northern slopes at 7,700 feet persists without essential change to the summit of Mt. Lemmon where forests of *Pinus arizonica* grow on the south-face and a heavy stand of *Pseudotsuga laxifolia, Abies concolor* and *Pinus strobiformis* on the north-face. The same botanist[4] with figures in the text has given a more detailed account of the influence of slope in the Santa Catalina Mountains in "The Vegetation of a Desert Mountain Range as Conditioned by Climatic Factors." Shaw,[5] a former student of the writer, has called attention to the importance of topography and exposure to light. "While crags and ridges may be free from snow in May or early June, the depressions between them frequently lie buried under snow until the middle or latter part of July. These masses of wet snow are apparently responsible for the drowning and suffocation of the trees and larger shrubs in these depressions. Other things being equal the snow disappears first from the east-facing and south-facing slopes; these slopes usually bear a more luxuriant and more varied vegetation than those facing the west and north. It would seem that, in the Selkirks, long-enduring snow masses, caused by heavy winter precipitations, topography, and exposure of the mountain slopes, are the most important single factor in determining the distribution of the alpine meadow and alpine desert vegetation."

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[1] *Postelsia,* 1901: 30.

[2] Fink, Bruce, "The Composition of the Desert Lichen Floras," *Mycologia,* I: 96, May, 1909.

[3] Shreve, Forrest, "Vegetation of the Santa Catalina Mountains," 1913.

Robbins[6] in outlining the native vegetation and climate of Colorado in their relation to agriculture emphasizes the fact that "the intensity of sunlight is distinctly affected by exposure and also by degree of slope. If we assume the intensity of sunlight to be 100, when it strikes a surface at right angles, its intensity, when striking that surface at an angle of 70°, will be approximately 98.5; at an angle of 60°, 96.5; and at an angle of 10°, 33.4. In the lower mountain valleys of the north and central parts of Colorado, the south exposures support a semi-arid type of vegetation, composed of cedars, scattered yellow pines, yucca, etc., while the cooler and moister north exposures are frequently clothed with Douglas fir, aspen, Rocky Mountain maple, etc.

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[4] Publication 217, Carnegie Institution of Washington, 1915.

[5] Shaw, Charles H., "The Vegetation of the Selkirks," *The Botanical Gazette,* LXI: 489, June, 1916.

[6] Bull. 224, Agricultural Experiment Station of Colorado, 1917.

CONDITIONS IN EASTERN PENNSYLVANIA.

The question arises in our consideration of the influence of slope exposure on the distribution of plant life, whether we can find any good illustration of such in the eastern United States. The members of the Geographical Society of Philadelphia are familiar with the region between Philadelphia and Norristown known as the Gulph. An excursion of the society was taken there on October 16, 1915, when the writer had the pleasure of indicating the character of the vegetation to the members, who were hardy enough to climb over the rocky slopes of the hills there. These hills are the South Valley Hills through which the Schuylkill River cuts its way at Conshohocken. Continued southwestward, they form the southern boundary of the Chester Valley and such streams as Darby Creek, Crum Creek, Ridley Creek take their rise on the south slopes of these hills. Gulph Creek at first flows approximately north, finding its way through a steep narrow gorge or gap (Fig. 1), then it flows due east, following the north slope of the South Valley Hills, until it joins the Schuylkill River. The backbone of these synclinal hills is a mica-schist rock known as the Octoraro schist of Ordovician age. Outcrops of this rock are seen especially well on the south-facing slope of the gorge through which Gulph Creek makes its way, as a turbulent stream (Fig. 1). It is on the steep, precipitous slopes (the top elevation being the 500 feet contour) of this water gap, that we find the influence of slope exposure on the distribution of the native plants of the region.

The north-facing slopes is the shaded slope throughout most of the day, especially in winter. In summer, the sun enters the wood in the morning, just after sunrise, and in the evening before sunset. This slope shows also lingering snow patches beneath the forest trees (Fig. 1). Such beds of snow were noted, as late as March 20, 1918. The soil of this slope is a loam, rich in organic remains of leaves and dead wood. It has a mellow character, not sticky, but open and friable. It easily crumbles into finer particles and has a rich-brownish black color. Its character may be summed up in the expression, a rich forest mould. Broken down pieces of Octoraro

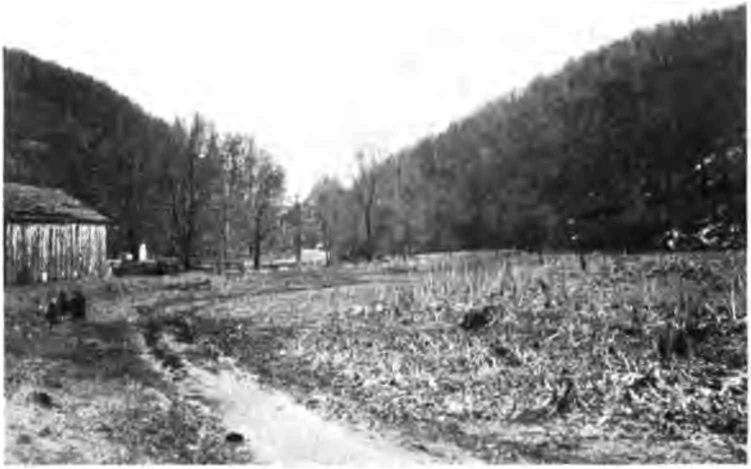

FIG. 1. LOOKING EAST TOWARD THE WATER GAP OF GULPH CREEK THROUGH THE SOUTH VALLEY HILLS, GULPH, PA., MARCH 20, 1918. Note the lingering snow patches at the extreme right on the slopes of the north-facing hill.

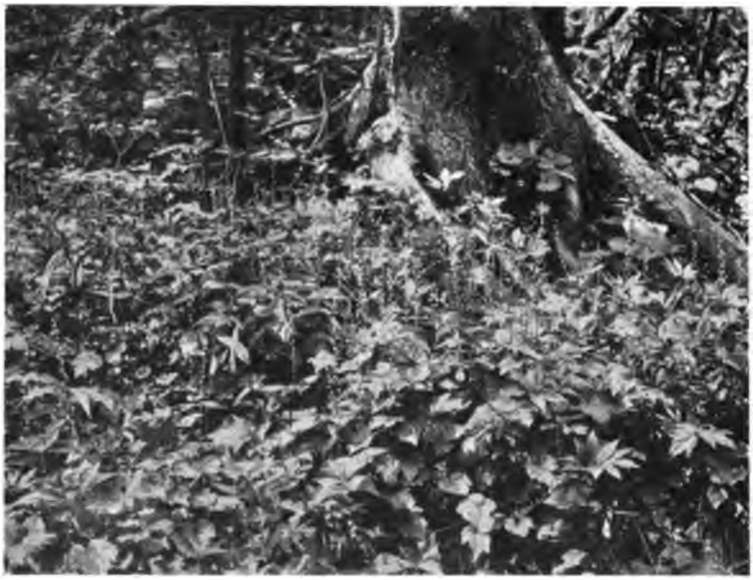

FIG. 2. DETAILS OF HERBACEOUS UNDERGROWTH OF THE NORTH-FACING SLOPE, GULPH, PA., MAY 14, 1914. Note the patch of wild ginger among the roots of the tree, the miterwort with its erect raceme of fringed flowers and the bellwort.

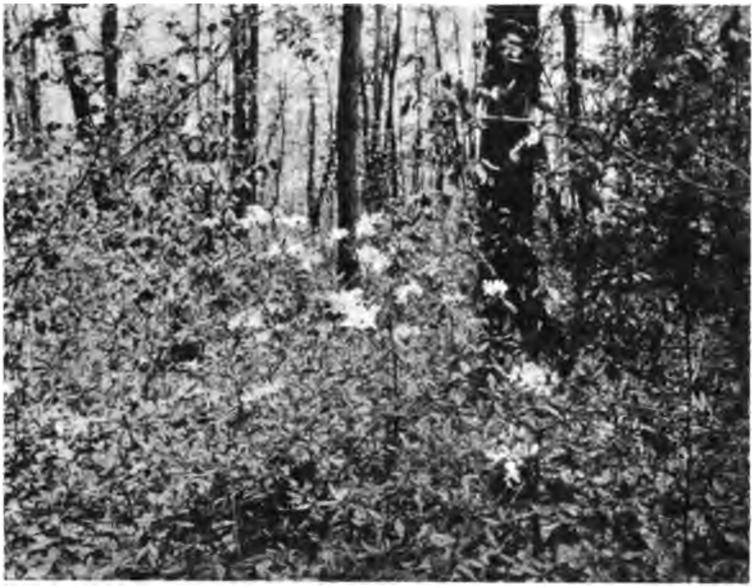

FIG. 3. TOP OF THE SOUTH-FACING SLOPE WITH SUNLIT FOREST FLOOR AND PINXTER FLOWER IN FULL BLOOM, GULPH, PA., MAY 14, 1914.

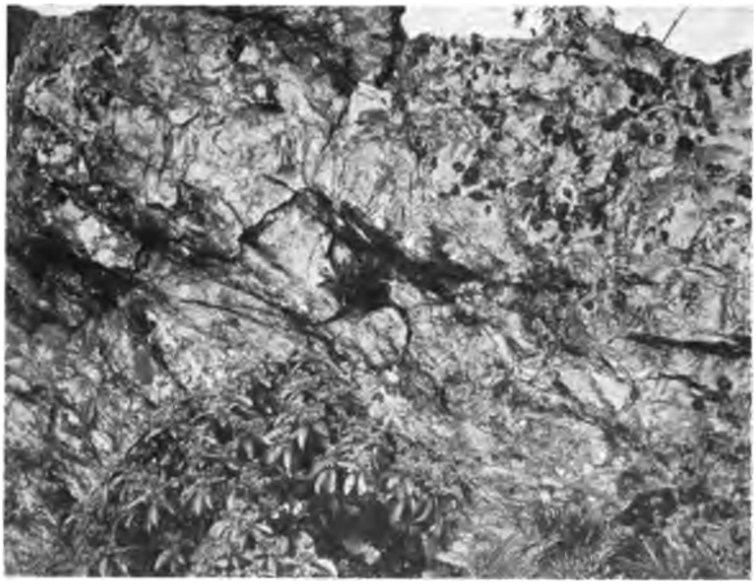

FIG. 4. OUTCROP OF OCTORARO SCHIST COVERED WITH TRIPE DE ROCHE (*Umbilicaria*). Note clump of laurel (*Kalmia latifolia*) about to flower at the base of the rock. May 14, 1914, Gulph, Pa.

schist are plentifully distributed through this soil (Fig. 2) and in some places these pieces are so abundant as to render digging in the leaf-mould difficult. Samples of this soil from a number of places on the shaded hillside show it to have a neutral, or slightly alkaline, reaction and deep and open enough to be well aërated. Here grew such trees as the beech (*Fagus grandifolia*), a shade- and humus-loving tree, the tulip tree (*Liriodendron tulipifera*), red oak (*Quercus rubra*), white oak (*Q. alba*), black oak (*Q. velutina*), linden (*Tilia americana*) and the fast-disappearing chestnut (*Castanea dentata*). The secondary trees were hornbeam (*Carpinus caroliniana*), along Gulph Creek, red maple (*Acer rubrum*) and the vine (*Vitis Labrusca*). The shrubby undergrowth, which fills up the light spaces beneath the trees and helps to shade the delicate herbaceous plants are witch-hazel (*Hamamelis virginiana*), dockmackie (*Viburnum acerifolium*), spice-bush (*Lindera benzoin*) and some dogwood (*Cornus florida*) scattered through the forest.

The herbaceous plants of the rich forest soil are unusually plentiful and diversified (Fig. 2). They are shade- and moisture-loving plants, perennial in habit. Many of them begin to flower while the dominant trees are leafless and they are roughly protected, as to their underground parts, by the litter consisting of the fallen and partially decayed leaves of the forest trees. The dark, mellow leaf mould permits the easy spread of the underground parts of the various plants and we find them growing in patches of greater, or less, size. There are such well known woodland herbs, as: bloodroot (*Sanguinaria canadensis*), liverleaf (*Hepatica triloba*), spring beauty (*Claytonia virginica*), wild ginger (*Asarum canadensis*) (Fig. 2), crane's-bill (*Geranium maculatum*), sweet cicely (*Osmorrhiza longistylis*), rue anemone (*Anemonella thalictroides*), jack-in-the-pulpit (*Arisaema triphylla*), bugbane (*Cimicifuga racemosa*), miterwort (*Mitella diphylla*) (Fig. 2), false Solomon's seal (*Smilacina racemosa*), water-leaf (*Hydrophyllum virginicum*), meadow-rue (*Thalictrum dioicum*), Solomon's seal (*Polygonatum giganteum*), carrion flower (*Smilax herbacea*), rich-weed (*Collinsonia canadensis*), golden alexanders (*Zizia aurea*), alum root (*Heuchera americana*), and the ferns, Christmas fern (*Polystichum acrostichoides*), spleenwort (*Asplenium ebeneum*), and rattlesnake fern (*Botrychium virginianum*). These herbs are all characteristic of the richest soils of our eastern deciduous forest region, where the trees are growing under the optimum conditions, and have long contributed to the litter of the forest floor, which is stratified. The top layer is composed of newly fallen leaves showing hardly any decomposition. The second soil layer consists of wholly, or partially, decomposed leaves. This layer is a mixture of humus and soil in varying proportions. This is the layer in which the roots of the ferns and herbaceous plants live, while below is the virgin soil into which the roots of the trees push their way down to the deeper water-holding levels. We must conceive of these top forest soil layers as living. Here is the seat of various activities carried on by animals (worms, insects, protozoans, etc.), bacteria, fungi and the roots of the higher plants. Neutralization of this soil is largely accomplished by the release of the lime salts on the decay of the leaves of forest trees, which are rich in them. Such a soil acts as a sponge, absorbing the rain water, if not too dashing, and the water formed by the slow melting of the snow patches, which slowly disappear as warm weather approaches. Hence a soil of this kind is a great regulator of the water supplies, which later appear as springs to swell the volume of the rivulets and brooks, which meander their way through the shady stretches of the overhanging trees.

The south-facing slope of the gorge of Gulph Creek is very different. Here the snow under the warming effects of the sun, which even in winter strikes the precipitous slopes of the ridge here, melts quickly. The sun has a drying effect on the soil (Fig. 3), so that the moisture of the upper soil layers soon disappears. Instead of the slow decomposition of the leaves to form a soil rich in organic material, the fallen leaves soon decay and in their rapid decomposition they retain the preliminary acid reaction of such a change, and the soil reacts decidedly acid to the litmus test, turning blue litmus a red color. Here the soil is bare in patches. The vegetation is quite distinct from the north-facing slope, as the conditions apparently are more xerophytic. Here grow such oaks as: post oak (*Quercus stellata*), chestnut oak (*Q. prinus*), black jack oak (*Q. marylandica*), black oak (*Q. velutina*), sassafras (*Sassafras variifolium*), chestnut (*Castanea dentata*), sour gum (*Nyssa sylvatica*), on the rocky outcrops the pitch pine (*Pinus rigida*), wild black cherry (*Prunus serotina*). The shrubs are pinxter flower (*Azalea nudiflora*) (Fig. 3), laurel (*Kalmia latifolia*), huckleberry (*Gaylussacia resinosa*), blueberry (*Vaccinium vacillans*). The ground flora consists of trailing arbutus (*Epigaea repens*), bird's foot violet (*Viola pedata*), hawkweed (*Hieracium*). The bracken fern (*Pteris aquilina*) is common and the mosses, *Polytrichum commune* and *Leucobryum glaucum.*

The showy plants of this drier slope are the pinxter flower (*Azalea nudiflora*) (Fig. 3) and laurel (*Kalmia latifolia*) (Fig. 4). The smooth surfaces of the Octoraro schist outcrops near the top of the hill, where the exposures are like knife edges, are characterized by the growth of the lichen, tripe de roche (*Umbilicaria*) (Fig. 4). The dogwood (*Cornus florida*) brightens, when in flower, the upper, flatter levels of the south-facing hill and it is in full glory before the leaves of the forest trees are expanded. The presence of the ericaceous plants, which Coville has proved thrive best in soils with an acid reaction, and the absence of a true forest soil full of the remains of vegetable organisms, are marked characteristics of the south-facing slope. The soil is comparatively raw with some clay, and worked between the fingers, it has a sticky character, not crumbling up as the soil of the north-facing slope. Its tilth is not good on account of its heavy condition. It is, therefore, not as open, or as well aërated, as that of the shaded hillside. This soil dries out more quickly, so that there are times in summer when it has a baked, or parched, appearance. No two floras could be more strikingly different and both are expressive of the differences of the physiography, topography and soil conditions of the two slopes. We have, therefore, at the Gulph on a small scale, it is true, a remarkably good example of the influence of slope exposure on the distribution of plants. The locality is fortunately chosen in this respect because fundamentally we have the same kind of rock on both hillsides. Presumably from the Octoraro schist by weathering the same kind of residual soils, formed in situ, originated. The differences in the characters of the surface soils has been accentuated, as the ages have gone by, through the action of the various factors outlined above until we have two hill slopes diametrically opposed as to the nature of their soils and the vegetation which covers them. We are led to believe from this study, that the slope and exposure both have been fundamentally influential in producing these divergences from an original, fairly uniform, virgin soil and by interaction with the higher plants, animals and other soil organisms have produced the profound differences in the animal and plant populations of the two slopes.

CONCLUSION.

This study represents the fourth of a series of comparative studies, where the vegetation of North America is contrasted with that of other parts of the world. The first paper in the series deals with American Heaths and Pine Heaths.[7] The second contribution is an investigation of the Alpine Fell-fields of eastern North America as contrasted with other similar areas in this country and abroad.[8] The third article is a joint study with a former student, Lieut. Vincent G. Burns (the first American overseas army) of the Hackensack Meadow, as an American example of a reed marsh, or fenland.[9]

We have reached a stage in our investigations of American vegetation where it becomes profitable to compare the American plant formations with those of Europe and other parts of the world. This comparison leads to the clarification of our concepts of the units of vegetation and also enables us to correlate our knowledge, so that it is possible to formulate certain principles upon such comparative studies. The three international phytogeographic excursions, which have been held, have done much to stimulate this kind of comparative investigation, when the studies of botanists in other climates and in other countries can be used for the extension of our knowledge of the fundamental principles upon which phytogeography, ecology and plant physiology depend.

This matter is of considerable interest to the members of the Geographical Society of Philadelphia, who delight to travel in this country and abroad. The tedium of a long railroad journey is partially overcome by a knowledge of the different kinds of vegetation seen from the car windows, as the train rushes along. The journey becomes much more interesting when the traveler is acquainted in general with the principal types of vegetation of the world. How much more interesting the shifting landscape becomes, when he can recognize the various forest types through which he passes, when the swamps, the marshes, the bays, the rivers, the hills and mountains, appeal to him? The education of persons, who love travel, is not complete until they know somewhat of the physiography, geology, botany and zoölogy of the world. How can they appreciate the beauty of a landscape until they know something of the elements, which enter into the formation of the scenic picture? This point of view the writer has been trying to impress upon his university students, so that they may appreciate that their culture is not complete without a knowledge of the natural world about them. With this knowledge, they can better enter into the spirit of the Greek, Latin and English classics, where reference is made in poetry and prose to the animals and the plants of the country where the authors happened to reside. Take the plays of Shakespeare, where frequent allusion is made to the flowers of England. The writer was impressed with this fact on a visit to the Shakespeare Memorial Building in Stratford-upon-Avon. Here is a dried collection of all the plants mentioned in Shakespeare. Then too in their fundamental training, the landscape painter, the landscape architect, the painter of stage scenery and camouflage scenery should have an acquaintance with the principal units of the vegetation of the country in which their artistic work is done. Some very bad mistakes have been made through a lack of just such knowledge. How many of our high school and college graduates have learned to appreciate the moods of nature? Not many, the writer feels sure.

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[7] Harshberger, John W., *Brooklyn Botanic Garden Memoirs,* 1: 175–186, figs. 8, June 6, 1918.

[8] Harshberger, John W., *The Geographical Review,* VII: 233–255, April, 1919.

[9] Harshberger, John W., and Burns, Vincent G.: *Transactions of the Wagner Free Institute of Science of Philadelphia,* IX, Part I, 1919.

INCREASING OUR BREAD AND MEAT SUPPLY.[1]

J. RUSSELL SMITH.

In view of the great attention that the question of food supply has aroused, it is of more than usual interest to look into our ultimate food resources. This article is a brief attempt to show certain aspects of two of them, bread and meat. It is presented in two parts—(*a*) The Tractor and Bread, and (*b*) The Sea and Meat.

A. THE TRACTOR AND BREAD.

In 1898 Sir William Crookes, a distinguished British chemist, wrote an alarmist paper prophesying an early world shortage of wheat. He was mistaken, although Lord Rhonnda, busy for two years rationing England, pinched by submarines, brought out a new edition of Crookes' book (1917) with this frightened statement:

"England and all civilized nations stand in deadly peril of not having enough to eat. As mouths multiply, food resources decline.

"The wheat-eating world is growing in population, while the wheat-producing acres are about all in use. What is needed is a thirty bushel to the acre crop in place of a thirteen bushel crop. Fertilizer, not more acres, is the hope."

Insular thought! He was thinking of the world in terms of England, and English diet as then in style.

There is no shortage of wheat ahead of a peaceful world, certainly for the next fifty years. After that it depends entirely upon the rate of increase in population, for plainly if population increases in geometrical ratio, there must come a time when any kind of food supply is manifestly impossible; but population does not so increase over large areas for long periods of time. And there are many good foods besides wheat. Our present shortage is due to military, not to economic, causes. Wheat is piled up now in Australia and Argentina waiting to get to market.

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[1] This article is a slight adaptation of certain selections from a book by the author on "The World's Food Resources," soon to be published by Henry Holt & Company.

Because of the uncertainty of future demand, *i. e.*, the prospect of an abundance soon after peace comes, the United States Government felt it necessary to promise to pay $2.00 for wheat of the 1918 crop, even if the world price is below that figure, and $2.25 for the 1919 crop. This minimum guarantee is a sign of possible plenty rather than famine. Great future resources are yet unused. There are three ways by which we may get more wheat: (1) Discovery of new wheat areas; (2) enlargement of existing areas through the planting of hardier varieties; (3) increases of the yield through the use of more productive varieties, new methods, and more thorough culture, fuller utilization of the land, new sources of fertilizer.

We cannot consider all of these factors here, but one element is worthy of special presentation.

There has come on the scene a new factor, whose possible power to make wheat is almost as little foreseen today as was the influence of the locomotive in 1840. It is the farm tractor, a machine still in rapid process of technical development. We have made great strides in the cheap production of wheat by getting tools that depend on the muscle of our strong beasts rather than on the muscle of our weak selves. The iron horse, hitched to the wagon and the boat, has made a new world. The iron horse (tractor) hitched to the plow is going to work another transformation, particularly in the world of wheat. It has just begun. The wheat crop of the world is today dependent, with few exceptions, upon the muscle of beasts. The Italians are even still cutting much wheat by hand on their terraces and little odd-shaped patches on their steep and rocky mountain slopes. But most of the land for the world's crops is plowed by the horse, the mule, the ox and the Indian buffalo who also draw the seeding drill and the reaper. There are enough camels helping to make the list picturesque. At the most, these farm animals may be needed for only six or eight weeks of work in producing the grain crop; but they must eat for twelve months. If there is a crop failure every third year they must eat for eighteen months in order to make two crops; and if there is a failure every other year, they must eat twenty-four months in order to make of two crops. Despite their months of necessary loafing beasts get tired when they work, and must rest. They get hot, they get sick, they go lame. The farm tractor does not get tired, it does not eat when it is not working. It can go night and day, and in the rush season a man who had a long period of rest can work fifteen or sixteen hours a day for many days, and then someone else can take his tractor and, with our present knowledge of lighting, keep it going throughout the night. One man, instead of driving three or four or even ten horses, turns on the power of twenty, or forty, or sixty horses that may work twenty-four hours a day. The acreage of level plain that a family can plant with this new help may be several times as large as that within the reach of man aided merely by beasts. "Our records show that the use of the tractor has increased the amount of land handled per person." Records from 149 farms in Minnesota show that 44 of these farms increased their farm area on an average 105 acres and at the same time farmed this increased amount with two horses less. Records from very large farms of 1074 acres show the use of 21 horses before a tractor was used and 12 afterwards."[2] To a considerable extent horse-food may also be man-food. It is already claimed that in level portions of Dakota a man, wtih the help of his wife and one child, can plant 120 acres.

"After purchasing their tractor, 9 of the 14, Kittson County farmers stated they farmed an average of 183 acres more per farm with the same amount of help. This made an average increase of 67 acres per man. Since small grain is the principal source of income in this county, this could more easily be done than in regions where corn is an important crop. Nearly all of the coöperators said they were able to save in hired help."[3]

This enlarged acreage means reduction in the cost of wheat growing. It means that wheat since it can be produced more cheaply can be grown in lands that we before thought worthless because of the uncertainties of rainfall. Take in the case of some Wyoming experiments at Cheyenne, which in three seasons produced respectively 9.3, 7.8 and 37.6 bushels. The average was 18.2. Four of the low crops and one of the high would still average 14.3, a figure that looks well among national averages, made possible by one good season in five. Such farming would scarcely be profitable with the aid of beasts, but it is easily practicable with the aid of the tractor.

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[2] Extract from letter, L. B. Bassett, assistant professor of farm management, University of Minnesota, February 26, 1919.

[3] University of Minnesota, Agricultural Extension Division, Special Bulletin No. 31, page 5.

In lands of low rainfall it has been well proved that the wheat yield can be increased in quantity and certainty by the practice of summer fallowing, which means plowing the land one year and raising the crop the next. By this means no plant is allowed to grow during the fallow season and much of the water that would otherwise evaporate through the growing plants (a surprising amount) remains in the subsoil, where it welcomes the next year's rainfall and combines with it to water one good crop out of the two years' supply. The trouble with this system in the work beast era is that it requires much cultivation. It is easy to see how the tractor helps at summer fallowing and so will push the wheat fields out into the lands of little rain and of frost. The tractor will enable wheat growing to become a dependable business in climates where frost or drought may almost spoil two crops out of three, if one bumper crop gets to the thrashing machine; farms, towns, and food-supply may then be found in places where now the farmer gives up in despair.

WHEAT IN THE UNITED STATES, 1839–1909.[4]
PRODUCTION.

Year.	Total (Bushels).	Per Cent. of all Cereals.	Per Capita (Bushels).
1839	84,823,272	13.7	5.0
1849	100,486,944	11.5	4.3
1859	173,104,924	13.9	5.5
2869	287,745,626	20.7	7.5
1879	459,483,137	17.0	9.2
1889	468,373,968	13.3	7.4
1899	658,543,252	14.9	8.7
1909	683,379,259	15.1	7.4

There is no way as yet to reduce to figures what the tractor may do for us, but it probably will enable seven great wheat-belts running through five continents to be widened out—toward the region of drought and frost through central Asia and central North

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[4] Census statistics not available for years prior to 1839. Finch & Baker (from) "Geography of the World's Agriculture," p. 14.

America, and toward the region of drought through Argentina, Australia, and South Africa.

This possibility of development means that we are in the beginning of another century of spring wheat, which has in the last sixty years made wheat more abundant in the commercial world.

Taken altogether, the undeveloped lands of the present wheat regions, the possible regions of the new wheat growing, the new varieties, the new fertilizers, the new knowledge, and the farm tractor, seem to promise that a wheat supply is within our reach for many, many decades if we can but devote our powers to the conquest of nature rather than to the destruction of man.

B. THE SEA AND MEAT.

Meat is scarce and getting scarcer, but there is no need for alarm about flesh food.

The sea: We have not discovered it yet. If man insists on eating animal proteins and wants a twenty-fold or hundred-fold increase in the supply, I call his attention to the sea as a place where he may drop his prejudice overboard, investigate, and probably find food in amounts that are beyond present computation.

FISH AND PREJUDICE.

Would you eat shark? Most likely not, according to your first impulse, yet the Chamber of Commerce of a southern city dined sumptuously last spring, then voted unanimously that the fish course was good, after which they were told by a representative of the United States Fish Commission that it was creamed shark. "Although the meat of some sharks, prepared in various ways, has been eaten, a particular prejudice has been held against certain kinds of sharks, especially the sand shark, which has been claimed to be absolutely unfit to eat. During the last summer the director of the Woods Hole Laboratory of the United States Bureau of Fisheries tested six species of sharks, including the sand shark, by supplying the meats as food to about fifty persons. Served in different ways, they were pronounced not only good, but especially pleasing in flavor and texture. Several persons said they were equal to swordfish."[5]

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[5] Commerce Report, October 12, 1917.

Why not eat shark? Because he is carnivorous, perhaps, you object, and eats any kind of meat he can get, including at rare intervals, human flesh. But no one objects to the speckled trout or the gamy bass, both as carnivorous as the shark and quite as willing to eat people if the portions are made small enough. Nearly all of our food fish are carnivorous, although they all derive their ultimate support from the vegetable life of the waters. Even the clear water of the sea has countless millions of minute plant organisms which are eaten by many small animal organisms; they in turn are eaten by each other and by the smaller fish, which in their turn are eaten by the larger fish; but the support of the whole pyramid of marine animal life from shrimp to whale, like the life of land animals, whether lion or elephant, is based upon vegetation.

We have many foolish notions about what is good food, and this seems to be especially true about what fish is good food. There is a pitiful tale of woe in the state archives of Maryland, where it has rested since it was sent up to the royal governor about 1680 by the inhabitants of one of the islands in Chesapeake Bay. They petitioned that he should send them from the royal bounty some food, for they were about to starve. They went on to rehearse that their crops had failed and that they had been forced to such extremities by the approach of starvation that they had been compelled to go down to the bay, dig up oysters out of the muddy waters and *eat them.* For the last fifty years the descendants of these same islanders have made their living by selling these oysters and have eaten them whenever they could afford them. At the time of the founding of this nation no gentleman was willing to be seen in an Atlantic seaboard town eating shad, for by condescending to such cheap stuff he might indicate that he was short of bacon at home. Yet for several decades the shad has been perhaps the most highly prized of all fish upon the Atlantic seaboard of the United States. So great was the demand for shad that it has been nearly exterminated.

Would you eat dogfish? Instinctively you probably say no, even if you never saw one. The dogfish is a little shark and thousands of people cheerfully ate him in the last three months of 1918, after he was renamed, and, thus respectably camouflaged, went innocently and quickly into general use.

If we can abandon a host of foolish prejudices as to what kinds of fish are good to eat, we have great possibilities of increased supply of a kind of food that is greatly needed. It can easily be shown that our supplies of bread and bread substitutes are almost unlimited. The same is true of milk, and of fish. Meat is sharply limited and must become scarcer as population increases. It is therefore a matter of great importance to the human race that the supply of fish may expand almost indefinitely and that "fish meat contains as much body-building food as beefsteak and is as readily digested as our other meat."[6]

THE FUTURE SUPPLY OF FISH

Promises to be not unlike the future supply of potatoes or milk, almost as large as we have a mind to make it. It is probably true that we now have the possibility of increasing our fish-supply fifteen, perhaps thirty or a hundred fold, without making any great increase in the part of a man's daily wage needed to buy a given amount of nourishment in the form of fish. This increased supply depends upon four factors.

1. The application of *Common Sense* in the question of what is food, and eating all the fish that are good for food. In this connection the present campaign by the United States Fish Commission and the arrival of the shark and the whale upon our tables are examples of a method that may easily increase our fish-supply. The Japanese are putting tough and muscular fish like the skate through the meat chopper, after which it is canned or made into sausages or loaves called "Kamaboka." Predictions of so many more fish rest upon the great basic facts that the sea is vast and the species of fish therein are many. The United States Food Administration says:

"There have been cases where a ship has sailed for over twenty-five miles through waters the surface of which was literally alive with fish, *of one variety only*. And when you stop to think that this was but one small group of fish among all those which roam and school in both surface and bottom areas, it is easy to understand how impossible it is that commercial fishing should dangerously deplete our total supplies of edible salt-water fish."[7]

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[6] "Eat More Fish," Division F, United States Bureau of Fisheries.

"We catch lobsters wastefully and neglect the chief enemy of the lobsters—the squalus, an excellent fish for the table, but not as yet used for food because its ugliness of mien is depressing to the finer sensibilities of the deep sea fisherman."

(Eating the lobster's enemy and then eating the lobster sounds like good business.)

". . . We shall change all that when we are forced to drop sentiment in favor of nitrogen. Aside from great quantities of unused fish, the bottoms of millions of acres of shallow waters are studded with albuminous jewels called clams. There are parts of the northern coast from Maine to Labrador where these are so abundant that they actually constitute a considerable proportion of the floor of the bays, and yet they are for the most part unused."[8] Man has only begun to draw upon this self-replenshing mine.

2. *New Methods.*—We are just learning how to catch fish. It is indeed surprising to think that man only began to catch sardines on the coast of Spain in 1862, and that for forty years they were taken in little rowboats manned by two or three men. In 1900 there came a revolution through the introduction of a *sailing vessel* of forty to sixty tons with twenty-five men. In 1915 they introduced the first steam vessels, which could go eighty or one hundred miles from shore, and produced a great increase in the catch. These facts may almost be said to be typical of the fishing industry, and when one remembers how long Spain and Portugal have been hungry they become almost difficult of belief. Improvements have recently been made in the operation of great nets hundreds of yards long between steamers that scour the open sea.

3. *The Fish of Warm Climates and Distant Places.*—The greatest revolution of all lies in the ice chest—artificial refrigeration. The people of the West Indies have eaten the dried fish of Labrador and Norway largely because Labrador and Norway had a cool climate in which fish would not spoil the same afternoon it was caught. Largely for this reason the teeming fish of tropic waters have busily eaten each other up almost undisturbed by man. Now

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[7] *Literary Digest*, June 15, 1918.

[8] R. T. Morris in "A Surgeon's Philosophy," p. 239.

the steam-driven fishing vessel with its engines and ammonia pipes can dump the fish into an ice room, or into freezing tanks and imbed them in a mass of solid ice in a few hours, to be kept a week, or a month, or a year, and sold in this continent or the next, as market conditions may dictate. There is no reason now why fish that sport around the shores of Florida, or Hawaii, or far Figi, may not be imbedded in ice blocks, loaded into holds of European steamers at Havana, Honolulu, or any South Sea Island bight, for consumption three months later in Belgium, Italy or Bulgaria, or if the markets do not require them in fresh condition they can with the aid of ice be carried from the reefs where they are caught to some tropic canning factory for manufacture into forms desirable anywhere. Thus a new canning factory is being erected in Hawaii, to be supplied in part by steam vessels that go off for a two-weeks' cruise, visiting uninhabited islets several hundred miles to the south.

4. *Fish Culture.*—We have yet the last resource, one which, indeed, in some places man has already tried with great success:—namely, the artificial raising of fish just as we artificially raise chickens.

Many centuries ago the Chinese and Japanese found out that fish-growing in ponds and rivers is one of the easiest ways of getting meat in a densely peopled country. Oyster culture was an art among the Japanese a century before the declaration of American independence. The German people are also systematic fish growers, devoting themselves chiefly to the carp, a fish that can be fed in a pond like poultry in a yard. There are many fish growers' associations in the empire and the total area of fish ponds approaches two hundred thousand acres. In Saxony one-half of one per cent. of the area is covered with fish ponds. (Compare with the three per cent. under cultivation in Cuba, or the two and one-half per cent. of United States area in wheat in 1917.) The fish are fed upon corn, vetches, potatoes, malt, snails, slaughter-house refuse and many other foods. The average yield is about one hundred pounds of fish per acre per year and much higher yields are sometimes made. But this is the intensive and expensive way. It is cheaper to help the fish take care of themselves.

The threatened extermination of many valuable species of fish has led to systematic study of fish by the government of the United

States and many other progressive countries. The United States Fish Commission began by investigating the life history of fish so that it might recommend to Congress the methods of restocking our almost empty streams. These investigations soon brought us face to face with the fact that the best way to restore fish was to take the mature eggs from the fish, artificially hatch them, then care for the young during the weakest period of their infancy when they are such an easy prey to many marauders, including their own parents. The United States Fish Commission now hatches billions of fish eggs each year and releases the fry in streams and lakes to replenish the supply. There are several salmon hatcheries in Oregon and Washington, shad hatcheries in the eastern rivers, lobster hatcheries upon the New England coast; and the Great Lakes fisheries receive more aid in this respect than any other locality. The governments of Canada, Norway, Switzerland and Germany are also aiding the industry by the same means.

The salmon, although a sea fish, has very peculiar habits which in some cases enable private individuals to hatch them for private profit. For many years there was a hot dispute among the salmon fishers as to whether the young salmon did or did not return exclusively to the stream where he was born. Finally the salmon answered it, for it was found that small metal tags placed in the tail of an eight-inch fry as he went out to sea in autumn remained until he returned several years later full grown to the stream of his nativity to breed. Furthermore, he returned to no other stream. Thus two or three fishing companies operating at the mouth of the river can safely raise young salmon, turn them out to pasture in their unknown feeding grounds of the great deep, sure that if they return to land at all they will come back to be caught by the men who turned them loose.

Thus far the artificial hatching of fish has been chiefly limited to river fish and some of the more easily caught river-running sea fish like the shad and the salmon. Scientists know how to reproduce the fish of the open sea, such as the mackerel or that greatest of all food fish, the herring. Thus far there seems to be no decrease of the supply which would indicate the need of artificial reproduction of these species. If the need arises, however, artificial reproduction will be resorted to. We do not yet know to how many other species these methods may be applied, but probably to nearly all. It is quite conceivable that a century or two hence there may be hundreds or even thousands of combination fish canneries, fish dryers and fish hatcheries, shaded by the coconut palm trees on the coral atolls of the Pacific and Indian oceans, the hatcheries supported by the same international organization that polices the world sea and keeps the world peace. There are interesting elements of completeness about this picture. The coconuts might furnish the oil for fish canning. The fish before being canned would give up their eggs which man would hatch much better than nature would. The lagoons within the coral islands might serve sometimes as harbors for fishing vessels, and sometimes as storage-ponds for the young fry from the hatchery.

I must add that this is not orthodox. The scientists of the Bureau of Fisheries point out that the tropic fish are very hard to catch. But what would they have said about the sardines of the open sea in 1850?

Still another element of completeness is furnished by the very important fact that agriculture must *intensify* by increase of cost. This fish culture is like the United States range cattle business of 1880—man turns out the young, and *nature* produces the crop.

The impending meat scarcity previously described is not so alarming as at first appears, if the fish supply is capable of indefinite expansion with small increase of cost. The Japanese have shown us that a nation can live on fish instead of meat with no impairment of vigor.

ULTIMATE USES OF THE SEA.

The sea may completely overshadow the land in its possible production of edible flesh, and that too with almost no labor for production. As factors pointing to such a conclusion, we have its area of 150,000,000 square miles in comparison to the land area of 50,000,000. We know that much of the land area is of very low productivity because of the varying limitations of drought, cold, rocks, low fertility and perhaps diseases. In contrast to this, the sea teems with life and fertility. All of the sea contains plant food, the leachings of all continents of geologic epochs, and while the trees of a land forest are spectacular, they may not of necessity represent a greater annual growth per unit of area than the product of a similar area of open sea where no plant, save perhaps a little floating seaweed, is visible, but where microscopic plant froms in great quantity grow not only on the surface of the sea but far beneath it, and microscopic animals and small animals a fraction of an inch long exist here in great quantities.

Examintion of our fisheries shows how little we have touched this resource. We have not begun to catch even the herring in the North Pacific. We are still throwing away, according to one estimate, fifteen to twenty thousand whales a year in the Antarctic Ocean alone. Each of these whales is the equivalent of about a hundred beef cattle. Each of these in turn is, according to the Department of Agriculture, equal to the annual product of about six acres of good Illinois land. Thus the fifteen thousand whales equal ninety thousand cattle, or the product of half a million acres of the best farm land anywhere occupied by white men.

When we start out scientifically to search the sea for food, we may easily find that a single species of the smaller floating mollusks, such as the pteropod, will equal in total bulk of edible food all the meat animals now possessed by man. Thus a few decades or centuries hence, the fishing ships of Britain might bring back from the Arctic, the Antarctic or the tropic sea, one hundred or two hundred pounds per capita per year of pteropods—fresh frozen, dried or canned. Furthermore, it may be as easy to do this for a population of two hundred million as for a population of fifty million. The same is of course true for New England, for France, for Japan, or any other industrious nation that applies science and energy rather than chance and prejudice to the problem of securing a food supply from the sea. Such a change would merely be the adoption by the western world of the already well-proved Japanese dietary of fish, cereals, vegetables and very small quantities of meat.

Doubtless this may sound fantastic to many persons of a so-called practical turn of mind, but I wish to call attention to the fact that there has been no systematic economic survey of the sea. Most of the scientific work that has been done in the past has been done for the systematic, classifying scientists. At great expense we have dropped a little dredge down twenty-five thousand feet, brought up all the traces of life we could, and classified every species we could identify, giving them two Latin names in a learned monograph for the book shelf of the zoologic or geologic specialist. Meanwhile edible pteropods (merely one of many species) float about in unnumbered billions waiting for some constructive servant of humanity to tell us just where they may be found, how they may be caught, how they may be prepared for food, and then to actually come teach us conservative landsmen how good they are and how to use them. It would be difficult to find a more useful piece of work than the effective introduction of hungry man to the food resources of the sea. A relatively small amount of work as man's efforts go, would in a few decades easily achieve such a results, and do much to put hunger out of the list of troubles of any people willing to work.

BOOK REVIEWS.

Miller, Leo E. *In the Wilds of South America.* Pp. 424. Illustrations and map. New York, Charles Scribner's Sons. 1918. Price $4.50 net.

It is the naturalist who seeks the wild places of the earth. Mr. Miller, in the service of the American Museum of Natural History, New York City, has recorded for us the story of his wanderings in the wilds of South America. His journeys extended over a period of nearly six years, and covered over 150,000 miles. He, therefore, speaks with authority of what he has seen. In his valuable book are accounts of travel in all countries of our southern neighbor-continent except Chile and French and Dutch Guiana.

To the faunal naturalist Mr. Miller's book makes its chief appeal. Without undue prolixity, the habits of beasts and birds are well stated. The catalogue is long, and in it may be found much of interest to the ordinary reader. The curious sloth, the jaguars of the Orinoco, the red wolves of Brazil, and the bears of the Andes, of which few have heard, furnish the high lights among the beasts. The gorgeous trogons of the tropical forest, the beautiful cock-of-the-rock, the egrets, pursued by the poisoning plume-hunters of Paraguay, the rhea, still abundant in Argentina, are vividly pictured. Many facts are given concerning the deadly bushmaster snake, the bloodthirsty caribe or piranha fish of the streams, and the stealthy vampire bats of Bolivia. Incidentally Mr. Miller punctures some of the wonderful stories concerning the great length of the Brazilian anacondas. No dealer could produce a skin over twenty feet long.

Because it is the record of a far-travelled eye-witness, the book is rich in sidelights upon the whole range of South American geography. The features of the country come clearly before us as we read. No writer has better described the paramos, those lofty, desolate plateaus, swept by icy winds, scourged by frightful electric storms. Few other persons are qualified to write of the steaming-hot Chocó country, with its indolent Negroes and its fabulous mineral riches of gold and platinum. The Chaco of Argentina, the giant cactus-forests of Central Bolivia, come before our eyes. We are transported to a succession of out-of-the-way places.

It is the people of the outlying sections of the various countries visited with whom Mr. Miller had most to deal. He gives us testimony as to the honesty and hospitality of the Colombians, but in general, the impression left is that of a continent whose best in the way of humanity is presented to the tourist and whose inner population presents a sad aspect. The bleak existence of the sullen Quechuas, the dwindling of settlement along the Orinoco, the persistence of peonage in the rubber-gathering districts, are facts not to be denied, and though the author mentions these only in passing, he adds considerably to the mass of unpleasant testimony which the popular travel-lecturers and the casual visitor choose to ignore. It is men like Caspar Whitney, Harry Franck, Professor Ross, and Mr. Miller, whom we need to show us that South America is still only a partly-civilized continent.

"In the Wilds of South America" should not be read hastily, for it has no climaxes, and no dramatic art is used to enhance any special points. The student of South American conditions, however, will need his pencil constantly in hand to make note of the many observations which are offered to his attention. Though the author makes light of the hardships which were met, the book gives sufficient evidence that they were by no means light, and we are indebted to Mr. Miller for producing such a sane, cheerful, valuable narrative under adverse circumstances.

WALTER LEFFERTS.

Lawson, William Pinkney. *The Log of a Timber Cruiser.* Pp. 214. Illustrated. New York, Duffield & Co., 1915.

An account, vivid yet ringing true, of the triumph of team play over nature in the preliminary work of opening up to use without spoliation one of the wild sections of this country. The author shows a delightful appreciation of the characters of his companions, a keen sense of the beauty, grandeur and poetry of the mountains and that simplicity common to lovers of the open and requisite to an unexaggerated description of a life of peril. He has not merely told of part of the work of the United States Forest Service, but also pointed out one road to the useful application of a spirit for arduous adventure. His book is informing and worth reading.

H. S. W.

Burns, Walter Noble. *A Year with a Whaler.* Pp. 250. Illustrated. The Macmillan Co., 1919. $2.00.

This is a first-hand account of a man who, out of sheer love of adventure, shipped as a green hand on a whaler out of San Francisco. It is an interesting tale of hardships, hurricanes, harpooning and health. On its way to the spring rendezvous of the whaling fleet in the Hawaiian Islands, the brig *Alexander* sailed south and ran into schools of porpoises, "coreys" of flying fish and occasionally enormous turtles, which were harpooned and brought aboard ship.

Standing to the north, the fleet reaches Behring Straits and the Arctic, where polar bear, walrus and whale are successfully taken. Other interesting features of the story are the discovery of a "moonshine" still, in operation by the Eskimos of the eastern Siberian coast, a fight with a herd of angry wolves, and a very narrow escape of the fleet of whalers from capture by the ice pack. After his many strenuous months of labor, the writer, together with the other forecastle hands, was paid off upon reaching his home port with one "big iron dollar" while the profits of the voyage amounted to over $50,000.

The story is interesting and is well told, and gives the reader a good insight into the life of the whalers. L. J., Jr.

Beebe-William. *Jungle Peace.* Pp. 297. Illustrated. New York, Henry Holt & Company, 1918. Price $1.75.

This book is dedicated to Colonel and Mrs. Roosevelt and the author doubtless thought that many others of similar tastes would like to become familiar with the animals, birds and plants to be found in the tropical jungles he describes. The next best thing to visiting such places is to be able to have them adequately described in book form. Mr. Beebe is an interesting writer and his pen pictures are frequently quite poetic. While his book is in the form of what is called popular natural history, the facts are set forth by a competent naturalist, who describes among other creatures those peculiar birds, the hoatzins. The author also delineates in a graphic way a wilderness laboratory which he founded in British Guiana, a place where the naturalist could live and pursue his work in comfort and be free from the many dangers of the Tropics. A thrilling and vivid account is given of the noosing of a giant bushmaster—the most deadly serpent of the tropics. In addition to the birds, insects are mentioned, especially the white ants. There is fragmentary mention also of a few of the West Indian Islands and a description of how New York looks from an airplane. Most of the illustrations are good. H. S.

GEOGRAPHICAL NEWS AND NOTES.

Under date of April 25, dispatches announce the arrival at Kodiak Island, Alaska, of Prof. Robert F. Griggs, who is planning to renew his explorations of the Valley of Ten Thousand Smokes. Professor Griggs is acompanied by a number of scientists and the entire expedition is under the auspices of the National Geographic Society.

On April 25, Professor Leslie W. Miller, vice-president of our society and principal of the Pennsylvania Museum and School of Industrial Art, was tendered a reception by the Art Club, of which he was one of the founders. He was presented with a gold medal for distinguished service, bestowed by the Art Club in recognition of his zeal and labor on behalf of the art interests of Philadelphia.

Dr. A. Hamilton Rice, of Boston, will start early in June on his sixth journey of exploration in South America. The United States government will receive from Dr. Rice the results of his geological discoveries upon his return, as has been the case following each of his previous voyages. His biological and ethnological collections have been presented to the Peabody Museum, Harvard University. To navigate the shallow waters of the Upper Amazon, Dr. Rice has had built a 45-foot launch, which is of 14-foot beam and only 20 inches draught. It will be shipped by freight to one of the South American ports and there assembled. The boat contains living quarters and a laboratory.

Nature calls attention to the vigorous protests which have appeared in the *Times* against the suggestion emanating from Toronto, that aëroplanes should be used for the purpose of driving caribou by the thousand into corrals, where they might conveniently be slaughtered. The carcasses thus obtained were to be used for increasing the meat supply of Canada and for export. If such a scheme were ever sanctioned the caribou would speedily share the fate of the American bison.

The further suggestion that airmen might destroy wolves and feral dogs by machine gun fire does not sound very practicable, but these deadly weapons could and probably would, be used against the caribou. It is devoutly to be hoped that no more will be heard of this proposal which has given offense to all true sportsmen, as well as to those who are concerned with the conservation of wild animals.

We learn from *Science* that the Royal Geographical Society has awarded the Founder's Medal to Colonel E. M. Jack for his geographical work on the Western Front; the Patron's Medal to Professor W. M. Davis, of Harvard University, for his eminence in the development of physical geography; the Victoria Medal is awarded to Professor J. W. Gregory for his many and important contributions to geographical science; the Murchison grant to Dr. W. M. Strong, of the Northeastern District, Papua, for his journeys and surveys in New Guinea; the Cuthbert Peek grant to Professor Rudmose Brown for his geographical work in the Antarctic and in Spitsbergen; the Back grant to the Venerable Archdeacon Stuck, of Fort Yukon, for his travels in Alaska and ascent of Mount McKinley.

Changing the School Maps.—Awaiting the result of the Peace Congress a group of teachers and principals associated with the Philadelphia public schools are holding back a revision of the teaching course of geography which was planned a few months ago. Geographers in all educational centers are alike waiting the final word on such questions as whether Dantzig is to be the gateway of Poland or Spalato the prize of Italy.

From the beginning of the war groups of teachers in Europe and America began to study the needs and possibilities of a better and more comprehensive course in geography than has ever before been afforded to pupils and students. As no war has ever figured so much in comtemporaneous writing it was realized that readers in all parts of the world were gaining a new knowledge of geography while the world sweep of the war omitted practically no part of the globe from their purview. Particularly was this the case with American readers, many of whom, prior to 1914, had little interest in the wayside towns and inland villages of Europe, the isles of the mid-Pacific or the African colonies.

Hooverism and the world-wide hunt for sources of food supply, of raw materials and the thousand-and-one products that entered into the waging of the war also gave a new meaning to commercial geography and in political, historical and commercial geography, the school-boy and school-girl have had innumerable courses of a practical nature presented for nearly five years in the press.

The formation of a National Council of Geography Teachers in 1914 was one of the first steps in the movement for the revision of methods of teaching this world-science. When the United States entered the war a committee of twelve geographers formed part of the Council of National Research. The work of this committee was extended and amplified until, at the close of the war, an active group of cartographers at the headquarters of the American Geographic Society were engaged in formulating the mass of data and the innumerable maps which geographers, ethnologists and historians compiled for the guidance of the diplomatists in arranging the peace terms. It was part of this material which formed the large library shipped over the sea on the *George Washington* on its first voyage to France.

In Europe the French, Italian and British geographic societies have been engaged on like work and the recognition which their labors have gained was shown by the reference of the South American boundary dispute to the Royal Geographical Society. The British Admiralty and the French Navy have also been engaged on a recharting of the seas and the formation of plans for instituting on the ocean standard time belts or zones such as divide the land areas of the United States.

The work of exploration, heretofore regarded as the chief cause for revising geographies, is subordinated by the war, although much exploring is being done in Alaska, Africa, Tibet and the Polar regions. But the students and teachers of geography now contend that the war has taught the need of an entirely new treatment of this subject in American schools, and that not only must the political boundaries and national capitals be known, but that a practical, every-day meaning must be given to the subject.—*Evening Bulletin, Philadelphia.*

Natural History quotes from an article in the *Geographical Review* for January, 1919, by Prof. W. W. Atwood: "The time has arrived when there should be a great awakening in the teaching of geography in America and when teaching must go far beyond what most grown people remember as geography. The importance of both physical and economic geography has been strongly brought to our attention by the war and even to a greater extent by the parceling up of the world, contingent upon the signing of peace. Never again will the United States stand in isolation, either political or commercial, and, as our market is to be the world, so we must study the world's geography.

"Geography has never been taught to any extent in America beyond the primary schools. Even the teachers of geography are not trained in any phases of the subject beyond the elements, for virtually no courses in geography are given in the colleges. All the higher institutions of learning should open departments of geography as fast as adequately trained instructors can be furnished. There are many students who would take up this field of work as a profession if America recognized it. Each of the large universities in France has a department of geography; there is a staff of eight specialists in geography at the University of Paris. Great English and German universities also are equipped; and similar progress has been made in other countries, as Austria, Switzerland, Italy, Denmark, and the Netherlands. The time has come when full consideration should be given to the relations between geography and the expansion of civilization."

ACTIVITIES OF THE SOCIETY.

AMERICA AS A WORLD POWER AFTER THE WAR.

BY PROFESSOR J. PAUL GOODE.

On the evening of March 28, a good sized audience listened to Professor Goode, of the University of Chicago, who described the commanding position occupied by America in relation to her economic resources. Many maps and tables aided the speaker in showing the relative positions to be assigned to various countries as producers of agricultural, mineral and other materials. It is not too much to say, that the speaker invested this apparently dry subject with great interest, as was manifested by the frequent applause of the audience.

INDIA AND THE WORLD WAR.

BY RUSTOM RUSTOMJEE.

The creditable rôle of India in the Great War was the topic of this gentlemen's discourse on the evening of April 9. The speaker, formerly the editor of a Bombay newspaper, belongs to the Parsee faith and represented the conservative native element which upheld Great Britain's cause in the recent war. The impressive record—military and financial—made in India, in spite of an energetic German propaganda, was discussed. Many colored lantern views and a series of motion pictures added interest to the eloquent remarks of the speaker.

NATIONAL WONDERS OF THE UNITED STATES AND CANADA.

BY MR. LE ROY JEFFERS.

Few lecturers have a more wide acquaintance with the beauty spots of this continent than Mr. Jeffers, whose wanderings have made him familiar with many of nature's sanctuaries not usually included in the itinerary of the ordinary tourist. On the evening of May 7, he conducted his audience from Maine to California on a scenic journey which was illustrated by a series of lantern views which, in beauty and variety, have rarely been equalled by lecturers who have addressed our audiences.

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THE NATURE AND POSSIBILITIES OF TROPICAL AGRICULTURE.

ELLSWORTH HUNTINGTON AND SUMNER W. CUSHING.

INTRODUCTION.

Year by year men talk more and more about tropical lands and their possibilities, but few have an adequate conception of what these lands really are. Even among professional geographers there is often much misapprehension as to the extent to which vegetation, for example, controls the possibilities of future development. Again there is great misconception of the extent to which different kinds of tropical regions can be relied on to provide food for a dense population and for export. Once more, the nature and possibilities of tropical labor are still the subject of the greatest diversity of opinion. To-day, and for long ages to come, the chief wealth of tropical lands is bound to depend on agriculture. The possibility of successful agriculture depends first on the nature of the vegetation, and second upon the capacity of the laborers. Hence a true understanding of the probable future of the tropics demands a clear comprehension of the relation of different kinds of vegetation to agriculture. So great is the need of such comprehension that it has seemed allowable to the authors to publish the following pages in spite of the fact that they were originally written in a style adapted to teachers in elementary schools. War work, which is not yet completed, has prevented the publication of the book for which the present discussion was originally designed, and has also made it impossible to rewrite it in a form better adapted to the BULLETIN.

Tropical vegetation may be divided into four great types, each of which has its own particular kind of human response. First comes the tropical rain-forest, the most exuberant type in the whole world. This grows where constant rain and warmth allow vegetation to flourish twelve months in the year. Next comes the tropical jungle. This, too, is exuberant, but the trees are less uniformly large and stately than in the rain-forest; there is much more admixture of bushy forms, and many more places where the trees are small and friendly. Such jungle grows in warm regions which are blessed with abundant rain much of the year, but which nevertheless have a distinct dry season during which there is a lull in vegetative growth. Descending a step farther in the scale we come to tropical scrub, a low bushy growth which often resembles the second growth in our pastures or the thickets of scrub oak, manzanita, and other bushes which frequently clothe rocky hillsides in many parts of the United States. Such scrub may grow on particularly dry hillsides in areas where jungle, or even rain-forest is the predominating growth, but its chief development within the tropics is in regions where the rainy season is comparatively short, and the dry season so long that plants lose their leaves and entirely cease growth for many months. Finally grasslands form the last great tropical type, unless we consider the vegetation at high altitudes. Grass grows more or less in many parts of the tropics, but its presence in the midst of rain-forest or jungle usually means either that the rain drains away with great rapidity through a sandy soil, or else that the land is water-logged part of the year so that ordinary trees do not thrive. More commonly, however, grasslands are found where a long dry season alternates with a short wet one, and where certain conditions of soil and ground water are less favorable to scrub than to grass. The balance between grass and scrub is very delicate, but their effect on man is quite different, since scrubby areas are much more easy to cultivate than those where grass prevails.

LIFE IN THE EQUATORIAL RAIN-FOREST.

It seems strange that the finest vegetation should be associated with the most backward types of men. Yet such is the case in equatorial regions where high temperature is accompanied by abundant moisture at practically all seasons. In the Amazon basin, eastern Central America, west central Africa, the East Indies, northeastern Australia, and the parts of India on the seaward slope of the main mountain ranges the trees are often so huge and leafy that their lofty tops form an almost unbroken canopy through which the sun rarely shines. In these dense equatorial rain-forests the trees are often covered with bright-colored parasitic plants, while long vines hang down as soft and flexible as snakes. Near the ground there is little vegetation except where the death of an old tree has left an opening. There hosts of young plants grow so fast that they seem to be racing, the prize being life for those that attain dominance and death for the rest.

In such a region man is subject to most serious handicaps. He has little energy because the damp, steady heat never changes and never invigorates. He suffers terribly from malaria and other tropical diseases. Not only do people feel debilitated because of the enervating climate, but the warmth and moisture cause noxious mosquitoes and other disease-bearing insects to swarm at all times. When ground was being broken for a railroad in the forest of eastern Guatemala the management dared not keep the West Indian laborers at work more than two or three weeks at a time. A longer stay would almost surely have led to death from malignant malaria.

A second great handicap in equatorial rain-forests is the difficulty of keeping domestic animals even in the clearings. Noxious insects plague them almost as badly as they plague man. For example, in large parts of tropical Africa the bite of the tsetse fly not only causes the deadly sleeping sickness in man, but is fatal to domestic animals except perhaps the donkey. Even if animals escape disease, they rarely thrive, for grain cannot be raised and what little grass can grow among the luxuriant trees is usually so rank and coarse that it is not nutritious.

The difficulty of keeping domestic animals emphasizes another great handicap of the equatorial forests, namely, the difficulty of transportation. If the natives attempt to travel through the forest without roads, they encounter swamps, great projecting roots, dense thickets, and other obstructions far worse than anything our ancestors met when they first settled in America. They are also likely to be attacked by wild beasts and snakes, as well as by poisonous insects. Suppose someone has energy enough to clear away the forest for a road. New plants spring up almost over night, and grow 10 to 20 feet in a year. The map of Quintana Roo, the densely forested and uninhabited southern part of Yucatan, for example, shows a number of roads, but when a traveller wishes to follow them he is told that they do not exist. They were kept open a few years when *chicli,* the sap from which chewing gum is made, was being gathered, but when this work was finished the trails were smothered in vegetation within two or three years. A macadam road or even a railroad may suffer the same fate, although more slowly. On the railroad that runs from the Gulf of Mexico to the Pacific Ocean across the isthmus of Tehauntepec, for example, men must be employed to cut the bushes every few months. Where communication is so difficult, people naturally cannot profit by intercourse with others who bring new methods and ideas. Bolivia, Peru, Ecuador, and Colombia suffer greatly because the equatorial forests which begin on the eastern slope of the Andes hamper communication with the Atlantic side of the continent, and so with Europe.

Another and even greater handicap of the equatorial forest is the difficulty of carrying on agriculture. When our forefathers cleared the forests of America their task was child's play compared with the clearing of an equatorial forest. Not only did they encounter smaller trees than those of the tropics, but they cut pine, birch, beech, and other soft woods most of the time, and not mahogany, teak, rosewood, and other tropical species as hard as oak. They cut the trees in the cool bracing autumn or in winter when a man wants to work fast in order to keep warm. Think how different it would have been if they had had to cut oak trees on the muggiest kind of hot summer days. When the trees have been felled the difficulties of the would-be farmer in the equatorial rain-forest have only begun. On our farms at home it is hard work to keep down the weeds, but suppose the weeds grow a foot or two a month, and keep on growing twelve months in the year. How could anyone keep them down! The useful plants would be choked almost before they sprout from the seeds. That is what happens in the equatorial rain-forest. Unless the inhabitants possess a vigor far surpassing that of the best farmers of the temperate zone, successful agriculture is impossible.

We are apt to look down upon the almost naked Papuans of New Guinea, the Pygmies of Central Africa, and the aboriginal Indians of the Amazon basin. We wonder at people who still live by hunting with poisoned arrows, who make their homes in little huts in the trees or on poles, who run and hide at the sight of a stranger, and who have nothing that can be called civilization. We ought rather to pity them, for even we, with all our opportunities, have not yet learned how to cultivate the lands in the equatorial forest, maintain good roads there, and avoid the enervating effect upon health and character. We can do these things at a place like the Panama Zone where many people are gathered in a small space, where vast sums of money are available, and where everyone is under government orders, but that is very different from the ordinary forest region. It is no wonder that the natives make little progress.

Vegetation grows so rapidly in regions of equatorial rain-forests that they might be the most productive parts of the whole world, provided men knew how to cultivate them. As yet, however, we obtain from them only such articles as rubber, chewing gum, quinine, mahogany, and other cabinet woods. The natives are employed by the white man to search for the trees from which these products are derived, but such work does not advance civilization. In temperate regions trees of the same kind often cover many square miles, but within the tropics a great variety of species usually grow together. So the natives wander through the forests, climbing tall trees sometimes to look out over the top of others and pick out specimens of the species they are seeking. Then they tap the rubber trees and collect the sap, or call the axeman to chop down a fine mahogany tree. Their overseers are often brutal white men who have come to the tropics simply to get rich, or because they have failed at home. Unchecked by the restrictions of civilization such men use any and every means to gain wealth or to compel the natives to do what they wish. Disappointment and ill health make them more and more brutal, so that they often treat the natives most cruelly. Altogether the natives are by no means improved by their work for the white man. They merely get a pittance which they spend for drink or for useless finery. They are isolated not only from the rest of the world, but from one another, for their mode of life permits only the scantiest population. In spite of our twentieth century progress the equatorial rain-forest still remains almost the worst environment for man.

Life in Tropical Jungle Regions.

The equatorial rain-forest does not occupy the whole of the warmest regions, for large parts are occupied by less luxuriant types of vegetation. As one passes from the equatorial regions of greatest and steadiest rainfall, the size of the trees and the thickness of their stand diminish. Tropical jungle takes the place of the dripping rain-forest, and the conditions of life correspondingly improve. This does not mean that the vegetation is small or scanty. Large trees still grow in abundance, but among such kinds as mahogany, teak, rosewood, and dyewood, one finds also a bewildering variety of palms, bamboos, tree ferns, bananas, canes, and many shrubby types. In drier regions prickly creepers and thorny shrubs add to the variety of plants. For miles the tangle of vegetation is often so dense that one can penetrate it only by cutting a path through the living wall. Now and then a group of chattering monkeys goes swinging through the tree-tops, or the harsh voices of parrots call attention to their own beautiful colors. Occasionally an elephant is seen browsing on the bushes, or dainty deer jump through the openings, while beasts of prey lie in wait on low branches or prowl in secret paths hidden from the sight of man.

In regions where tropical jungle is the natural growth the people get a living with little effort, provided the population is not dense. The cocoanut and banana furnish food with practically no work; the big fruit of the papaw supplies a family with a meal for the plucking. Wild rice in parts of Siam and the edible seeds of the bamboo in parts of Central India too rugged for farming, can be gathered when needed. Elsewhere the breadfruit tree, the sago palm, the sugar palm, the jack-fruit tree, and many other food-producing plants need only be planted and protected in order to furnish abundant food. Life is so easy that the natives have nothing to spur them to effort. Clothing is a luxury, not a necessity, so that they do not think it worth while to work much to get it. Houses need to be little more than a thatch of palm leaves set on a rude frame of poles. That is enough to keep out the rain and the wild beasts. Wood for building and cooking can be picked up anywhere. Under such conditions we should not expect much progress among the people of the well-watered jungle regions of southern India and Ceylon, Indo-China, and the East Indies, Central America, and large areas on the borders of the dense rain-forest in Africa and South America. Those are the places which we think of as typically tropical. They form by no means all of the tropical zone, for rain-forests on the one hand and grass and dry scrub on the other occupy vast areas. Yet regions that were originally covered with jungle are the parts where the majority of tropical people live and where there is the most lavish growth of cocoa, coffee, bananas and many other products which northern races are more and more importing from warm regions.

The lowest and easiest type of agriculture is found in the sparsely settled parts of the tropical jungle. It consists of planting a few palm trees, banana plants, and other fruit trees. After that, as is often said, the native has nothing to do except lie under the trees and wait for the fruit to drop into his mouth. Such agriculture, if we may call it by that name, is a step toward civilization, but only a slight step, for it does not stimulate the natives to steady work.

In the more densely populated tropical countries a somewhat higher type of agriculture prevails. The bushes and smaller trees of the jungle are hacked down and the larger trees are killed by cutting off a girdle of bark. At the end of the dry season the brush is dry enough to burn. Then the primitive farmer goes over the burned field with a pointed stick making holes into which seeds are dropped. A little rough weeding is carried on until the cultivated plants are large enough to take care of themselves. That is all the work until harvest time. The easiest food to raise is such starchy tubers as yams and the common sweet potato, or such starchy roots as the cassava or manioc from which tapioca is made. Several soft varieties of Indian corn, the common pumpkin, and various kinds of beans furnish a more healthful and more lasting supply of food than the roots. They also require more careful planning and more work, and thus have a correspondingly greater effect in promoting industry. When the crops are harvested some provision must be made to preserve them until others are ripe. In many places the grains and roots are stowed away in rough storehouses, but in southern Mexico, for example, the farmer merely bends each cornstalk so that the top points downward and the rain cannot get into the ears. There he leaves it, gathering a little from time to time as it is needed. Of course much decays or is eaten by birds, beasts, and insects. The farmer prefers to let that happen rather than undergo the effort of building a storehouse which rats cannot enter.

Agriculture in tropical countries is more difficult than in the temperate zone. In the first place, the soil is easily exhausted. The constant heat and moisture and the ravages of white ants cause dead vegetation to disappear so completely and rapidly that the soil contains little humus and hence little nitrogen. Other plant foods are also scarce, for as soon as the soil is decomposed by weathering, the heavy rains leach them out. Thus although the first crop is often most bountiful, later ones diminish rapidly, especially when corn and millet are planted. Hence many jungle farmers clear a new patch of jungle every two or three years, and often every year. If the dry season happens to be short and showery, the bushes that have been cut may not become dry enough to burn, and no crop can be raised that year.

In densely populated regions the same land must be used year after year in spite of the scanty crops. Here other troubles arise. for instance, if other weeds are kept down, tropical grasses, like witch-grass but far worse, often overrun the land. In the Philippines "cogon" grass has been the ruin of thousands of farmers who have tried to use fertilizers and otherwise follow modern methods so as to keep the same field in cultivation for a nubmer of years. As the grass often grows as high as a man's head and has corerspondingly tough roots, no ordinary animals can drag a plough through it.

The difficulties due to the poor soil and rank grass are increased by the fact that in jungle regions domestic animals generally thrive only a little better than in the rain-forest. Compared with the population, the United States, for example, has nearly 30 times as many horses and mules as India. Even though cattle are seen at work everywhere in India, the total number in proportion to the people is only two thirds as great as here, and in tropical India they are still less numerous. This includes buffaloes as well as the common humped cattle. Moreover animals are of poor quality, undersized, ill-fed, and ill cared for. Hence not only are they unable to plough tough sod, but they supply only a small amount of manure especially in the moister regions where it is most needed. In some of the moderately dry parts of India goats and sheep are often used as manuring agents. By day they wander here and there to pick a living, but at night are penned on the fields of those who have hired their services.

As the climax of his difficulties the tropical farmer has to contend with all manner of insect pests, rusts, blights, and bacterial infections. They are worse than those of the temperate zone almost in proportion to the greater luxuriance of vegetation. Thus although the farmer can get a living without much difficulty, he is greatly handicapped when he attempts any new methods. When we add to this the lack of energy which is natural in such a climate, it is not strange that through long ages he has acquired the habit of not caring whether he makes progress or not. If our ancestors had lived for centuries in such a region, we should probably be as inefficient as the present people of the tropical jungle.

The inefficiency of tropical people is well illustrated by the way in which rice is often raised. When the fields in the wet districts of Ceylon, for example, have been thoroughly saturated by the first rains of the season, or by water turned on from irrigation ditches, the soil is turned up with a rough spade or wooden plough and then trampled with the feet until it becomes a creamy paste of mud on which the seed is sown broadcast. When the seed has germinated, water is again admitted, and the rice left to grow until harvest time. Then the water is turned off and the crop ripens upon dry ground. The grain is harvested with sickles and is threshed by being trodden under the feet of bullocks. It is winnowed in an equally primitive fashion by being thrown into the air from flat basketwork trays, and caught again, while the chaff is blown away.

The people who practice this careless mode of rice culture are astonishingly indolent. For instance, in 1903 the inhabitants of a certain district in Ceylon raised an unusually large crop of rice. They thereupon sat down to eat it, and raised not a blade of rice the next year. The third year their seed rice was almost all they had left. This was sown, but the crop was largely destroyed by a kind of caterpillar. Then these lazy people who had not worked for nearly two years appealed to the government to keep them from famine.

Although such occurrences are typical of tropical people, they become less common where more careful methods of rice culture are employed. In many regions, for example, the rice seed is sown in prepared beds. Then after 5 or 6 weeks it is painstakingly transplanted to the fields which have been carefully ploughed and manured. The rice fields are surrounded by mud embankments so constructed that water can be held there week after week, not standing perfectly still, but gently moving. The beds are occasionally weeded with care and finally the crop is harvested promptly so that the ripe grains may not fall out and be lost. Under good conditions 50 pounds of rice will furnish seed for an acre of transplanted rice, and the yield will be 2,400 pounds or about 50-fold.

This amount, when combined with some beans or meat to furnish protein, is ample food for five adults a year. Thus a population of 2,000 per square mile is easily possible. On that basis all the people in the United States could be supported on an area equal to New York State.

Rice culture is a distinct help in promoting civilization. For one thing, a rice farmer can profitably keep cattle. Even though they are small, they can plough the soft soil of the weedless rice fields. As they can be fed on rice straw the scarcity of good grass is not important. The cattle oblige the farmer to take forethought in caring for them. They also enable him to use the same fields permanently, for they supply manure, and thus the soil does not become exhausted.

In the next place, if the enrichment of the soil enables the farmer to devote his energies to one particular piece of land he is likely to build new rice beds, take care that he has a good supply of water, and that all his little ditches and dikes are in good order. He finds that the work of one year gives him much benefit the next. Moreover, he cannot go off and leave the rice crop untended, for a few weeks of carelessness will ruin it.

All these conditions cause the careful rice-raising people of India, Java, Indo-China, and southern China to be more industrious and reliable than other tropical farmers. For the same reasons they are more hopeful and progressive, since they have learned that their efforts are not in vain. Moreover, as the population where rice is raised is much denser than elsewhere, wild animals do less damage than in other tropical regions, roads can be maintained, and the people can get more stimulus from one another and from outsiders.

POSSIBILITIES OF PLANTATION AGRICULTURE.

In addition to rice farming another kind of tropical agriculture is helping to promote civilization. It depends on the fact that the people of more bracing climates are willing to pay good prices for tropical products which once were luxuries but are fast becoming necessities. Before the days of steam navigation when Europeans rarely came to the tropics, there was no agriculture for export. Hence there was no crop for which money was paid, for tropical trade was then almost wholly by barter, as it is now in many primitive regions. Accordingly the farmers could not lay up capital. Their rule was "Grow all you need and consume all you grow."

When Europeans came to the tropics, however, they began to want tea, coffee, cocoa, rubber, and other products. In general these are not like the staple food crops which have to be planted each year. They are tree crops which do not require frequent renewal. Hence they are raised in large plantations where the same kind of tree or bush is planted over wide areas. Coffee is a good example. Although small quantities are raised in regions such as Java, Ceylon, Central America, and Mocha where it first became known, four fifths of the world's supply comes from Brazil. There hundreds of thousands of acres of tropical jungle have been cleared of most of the trees, and coffee bushes have been planted in the shade of the rest. Tea flourishes under similar conditions, although it grows over a wider range of latitude than coffee. It is raised in great plantations on moist sunny slopes not only in places like Ceylon and the lower Himalayas north of Calcutta, but especially in southern China.

Bananas fall in the same class with tea and coffee. They prefer the moister parts of the jungle on the borders of the equatorial rain-forest, and grow well in broad lowlands. In Central America, the West Indies, and the northern part of South America great corporations from the United States have cleared thousands of acres of jungle and planted it with this easily raised fruit. One great company employs many thousand men and has regular lines of steamships to bring bananas and other tropical fruits to New Orleans, Baltimore, Philadelphia, New York, and Boston. In the same way Europeans and Americans have established large plantations for the cultivation of the coca tree from whose pods chocolate is made. Some cocoa comes from tropical Africa, particularly the Island of Saint Thomas, and from Asia and the East Indies, but two thirds of the world's supply is from the jungles of Central America, the West Indies, and the northern part of South America.

The principal plantations are in Ceylon, the East Indies, and the Malay Peninsula. The world's supply, to be sure, still comes largely from the wild trees of the forests of Central and South America, but the plantation is of constantly increasing importance.

Still other tropical plants, such as the manilla hemp of the Philippines, the best of fibers for strong twine and rope, have their home in the jungle, but are gradually being raised more and more exclusively in plantations. The same is true of indigo, which is still raised in large quantities in India and Java in spite of the great use of aniline dyes made from coal tar. Quinine, the great remedy for malaria, is another article which was formerly derived from wild trees, but now the cinchona tree from whose bark it is made is cultivated in plantations not only in the Andean countries of its origin such as Bolivia and Colombia, but in Java, Ceylon, India, and Jamaica. The sweet bark of the cinnamon tree, raised especially in Ceylon, furnishes still another sample of the many kinds of tropical products which are being more and more used by Europeans and Americans, and which lend themselves to plantation agriculture.

Sugar as an Illustration of a Plantation Product.—To the world at large the most important of all plantation crops is sugar. Two hundred years ago, the average person in England consumed less than four pounds of sugar per year, and the average American a decidedly smaller quantity. To-day, under normal conditions, the average English consumption is almost 100 pounds, and the American over 80. Sugar has become such an important food that the average person consumes a third as much of it as of wheat. Hence it is not surprising that many of the sugar plantations are of large size and highly profitable. Some employ as many as 5,000 people and have scores of miles of little portable railways which can be laid wherever they are wanted to bring the cane from the fields. In the Hawaiian Islands the absence of any duty on sugar imported into the United States has in good years permitted profits of three or four hundred dollars per acre. The industry is so profitable that it has been worth while to go to great expense for irrigation. Water has been pumped in some cases to a level several hundred feet above its source, while in other instances, tunnels have been built through mountains to bring the water from the windward side, where it is deposited by the northeast trades, to the dry, sunny leeward side, where the cane grows fastest provided it is well watered. The sugar plantations are typical of the great profit to be derived from plantation agriculture. They proclaim the line along which the future development is likely to proceed.

The rapid increase of plantation agriculture is beginning to have an important effect upon tropical civilization. In places where there are no plantations white adventurers still send the natives out into the jungle to gather wild cocoa, wild cinchona, wild rubber, and even wild hemp and wild bananas. The natives live as they have always lived. If they have enough to eat, they stay at home no matter how eager the white man may be to complete a load for his vessel. If one day's work gives food enough for three days, they work only a third of the time, no matter how much the white man complains. If they contract malaria or other diseases in the jungle they die without care or medicine.

On the plantations these things are beginning to be changed. The plantations are usually owned and managed by Europeans or Americans who have a permanent interest in them. On the best and most profitable plantations the employees are obliged to live in better houses, wear better clothes, and take more care of health and sanitation than tropical people ever thought of before. Drains are dug, and other measures are taken to get rid of mosquitoes and other disease-bearing insects. Machinery is introduced, and the natives are taught to use it. At first they are competent for only the simplest tasks. Little by little, however, they acquire skill and industry. Preference is given to those who work regularly, keep their huts neat, obey the health regulations and show evidence of willingness and ability to learn the complicated methods of the white man. Another incentive to progress is the desire to imitate the white man and purchase some of the luxuries displayed in the company stores.

On the plantations health is considered of great importance. Where the government does not provide hospitals, as in Ceylon, they are often provided by private companies, as a matter of economy, not only for the white man but for the natives. The largest fruit company in tropical America regularly deducts two per cent. from the wages of its employees from the highest to the lowest, and uses the money as a fund to protect the general health. Thus the strength of the natives is not sapped by disease so much as formerly, and they are better able and more willing to do hard work.

As the plantations increase in number, the population grows more dense. The land is so fully occupied that there cease to be large waste areas where lazy natives can pick up a living on wild fruits. Thus while the plantations provide the opportunity for steady work, they are also making it impossible for people to get a living unless they settle down to such work. Of course it is still difficult to find tropical people who will work except when compelled to do so by hunger, but the standards of life are beginning to rise. This is bound to happen more and more, for the tropical zone to-day offers perhaps the largest and richest of all fields for the investment of capital and brains.

Java under Dutch rule has carried the plantation system farther than any other country. There rice-growing and plantations under European management combine to encourage steady work to a degree scarcely equalled in any other tropical region unless it be the Barbadoes and Jamaica. As one result the population has increased enormously. We have no figures for earlier times, but in the last forty years, *without immigration,* the population has doubled. On the less rainy north side of the island where tropical jungle prevailed before it was cleared, large areas support 1,000 or 1,200 people per square mile. This is even more dense than the population of manufacturing countries like Belgium and England. Yet so rich are the lands near the equator that Java does not begin to raise as much food as she might if her people had the energy of the temperate zone.

Other Types of Tropical Countries.—Although equatorial rainforests and tropical jungle are the two most important types of vegetation in the warmest parts of the world, three others deserve mention. One is tropical scrub, consisting of bushes from five to twenty feet high. Provided there is rain enough to support a fairly dense population the relatively dry regions where tropical scrub prevails are the best parts of the torrid zone aside from the highlands. Northern Yucatan and considerable areas in the Indian peninsula are good examples. In such regions the long, dry season diminishes the number of mosquitoes and other disease-bearing insects. Moreover, people's health is improved by the dryness of the air which is a great help where the temperature is always high. Then, too, life is not so easy as in the jungle regions where plants grow more vigorously. People have to work for a living, and must make provision for a long period of many months when no crops ripen.

In the latitudes where tropical scrub occurs and also interspersed among the jungle there are large areas of tropical grasslands or savannahs. They are well illustrated by the Llanos of Argentina, the Gran Chaco of Brazil, and the plains of the Sudan. Although wild animals such as buffaloes, antelope, and the lions and tigers that prey upon them flourish in such places, the grasslands are not good for man. In the long, dry season it is often difficult to get water without digging wells of extreme depth. The sod is so tough that it is almost impossible to plough it. Therefore most of the natives of the tropical grasslands keep large herds of cattle and lead a wandering life, which does not promote civilization.

Tropical highlands where the vegetation is sometimes grassy and sometimes like that of latitudes farther north have all the advantages of the tropical scrub and their climate is more bracing because of the altitude. Therefore they are the seat of the most progressive tropical countries. Abyssinia is an example. Aside from Liberia, whose independence is due to the influence of the United States, it is the only part of Africa which has been able to maintain itself against European encroachment.

The preceding discussion of the relation of vegetation to the civilization of tropical lands deals only with some of the more elementary phases of the problem. Those elementary phases, however, are at the very foundation of future progress. The white man may exploit the tropics and skim them of their wealth, but that will do the world little good unless at the same time there comes into existence a tropical population which is sufficiently civilized and sufficiently energetic to raise more than enough for its own needs. Strange and disconcerting as it may be, the luxuries and exports of the tropics seem to be easier to raise in large quantities and on a permanent basis than the staples which are adapted to the nutrition of a sturdy and healthful people. Judging by the present conditions the greatest of all problems will always be the people. First, to give them the incentive to work; second, the enable them to keep domestic animals fit not only for ploughing and to furnish fertilizer but for human food; third, to make it possible to raise the great staples such as corn and rice permanently for generation after generation on the same land; and fourth, to make the people healthy and energetic enough so that they will want to produce more than enough for their own consumption—these are among the greatest of tropical problems. Back of all of them stand the inexorable facts of the effect of climate upon the growth and vigor of both plants and animals, including man. If we would rightly estimate the future possibilities of the tropics these are the most basic of all subjects of study.

AWBURY ARBORETUM.

On Saturday afternoon, June 7, more than one hundred members of the Society with their friends visited the Awbury Arboretum under the guidance of the Excursion Committee. This tract of about thirty acres at Washington Lane Station has been quite recently presented by Miss Caroline E. Cope and other members of the Cope family to the City Parks Association to be maintained as an arboretum and refuge for migratory birds. The gift is of large value and generously endowed. The upland area is already very well and beautifully developed in the English style. During a pause in the introductory walk Mr. Andrew Wright Crawford, secretary of the City Parks Association, spoke briefly of the original thought and purpose of the gift. The circuit of the grounds having been completed the members seated themselves on a shaded grassy slope to hear Dr. John W. Harshberger describe the botanical features of some of the trees. Prof. Arthur W. Cowell, of State College, the landscape gardener of the Arboretum found it impossible to attend the meeting, but prepared a very interesting descriptive paper, which was most entertainingly read by Mr. William Draper Lewis and illustrated with a large scale plan.

Following this Mr. and Mrs. Lewis entertained the party at tea on the lawn of their residence adjoining the Arboretum.

THE AWBURY ARBORETUM.[1]

TO THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA:

The Awbury Arboretum is before you. The beauty of its landscape, the result of one landscape gardener's dreams and foresight of some sixty years ago, now appeals to us all. Dreams are not very tangible things, yet all the good things we have in the world seem to grow out of somebody's vision, somebody's imagination looking ahead. With landscape conceptions such looking ahead is fraught with patience greater perhaps than with most undertakings because of the time required for realization. We dream out a picture, plant out some miserable little saplings and scraggly bushes, and cover the red soil with grass seed and then wait, wait sixty years for the dream to come true—for the saplings to present in tangible form the picture dreamed out, painted now in real landscape material and color rather than in pallette colors, or in the print designs and plant lists.

Continuity of purpose is nowhere more essential than in the making of a landscape except in the establishment of an Arboretum or a Botanic Garden. The charm of Awbury now betokens the careful arrangements of planting of sixty years ago and the restraint and confidence and patience of those who tended and watched this growth up to to-day. Of the two parts in the creation of landscape, that of the watcher is less appreciated but certainly as important as that of the designer. What we have inherited from the original maker of Awbury and from those whose love of trees and landscape vistas has preserved to us, let us observe and appreciate to the fullest. We shall direct our endeavors to preserve and enhance and continue this idealistic natural landscape-making in the new ground given us to develop for future generations to enjoy with these two ideas in mind. We hope that such organizations as yours will share the responsibility of patient waiting for the ultimate result of this new planting and in undying diligence in seeking out new species, new varieties to complete the collections.

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[1] Address by Professor Arthur W. Cowell, of Pennsylvania State College, on the occasion of a visit to the arboretum by our Society on June 7.—ED.

We have incorporated in Awbury now a new idea which will not add one whit to our probable success in making charming landscape compositions. Rather are we liable to fall into deep water and drown in an ocean of plant families, species multiplied to scores, and varieties by the hundreds in our enthusiasm of gathering together here all the plant kingdom which will thrive. The original planting of Awbury was essentially simple both in plan and material. That is a good rule to follow in landscape composition. Yet we often gain a wealth of added pleasure and interest in landscapes made up of numbers of different species and varieties of plants though still adhering to simplicity in the arrangement of the massing and groupings. It is no criticism of the founder of Awbury to say this, rather is it mentioned with a profound appreciation of his good judgment. If we succeed in a small measure with an unlimited variety of horticultural material in creating the shear restfulness and repose of these foliage masses enframing the lovely swales and graceful drives we shall be fortunate indeed. The play of light and shadow here, the joy of the birds, to which you listen, so content here within the very artificial establishments of a city environment—these are parts of the landscape. I ask myself often, will Awbury as a student's rendezvous be as splendid?

It may be. The Awbury Committee has been careful to so plan the future that the arrangement of the masses, the new grading and the required paths and drives shall follow identical ideals in plan. You will note that they connect and develop further the lines and masses of the older parts. True—the masses are made up of a new material—plants of all the families in groups kept as nearly together as feasible in order to further the arboretum idea of helping him who would be acquainted with plant relationships and plant differences and of gathering together in this ideal spot as many kinds of interesting and useful trees and shrubs and hardy plants as possible. This will assist him who would study to select plants for his own grounds, the nurseryman who would know plants for their intrinsic value and interest, and it is hoped, the artist and the landscape student who would know plants for their value in pictorial design. To every visitor the pleasure of restful park scenes, the recreation contained in what is before you, is afforded for all time.

Technically you will discover that especial care is being given to plant family grouping. The Rose family will be found along Chew Street where a beginning has been made in the marginal plantations which contain may of the crabapples, plums and cherries, the spireas and the thorns besides wild roses. It is only a beginning. Soon the site McNabbtown, which was bought and razed, will begin to show the development of a rose garden to contain, we hope, every variety of garden rose known.

Nearby is the family which is rich in household shrubs, for you note the many beautiful viburnums or snowballs, loved of everybody, and birds too. On the other side of the swale, their cousins, the diervillas or weigelas are now already colorful in their first year of flowering. Here and there the honeysuckles (lonicera) beautiful in flower foliage and fruit. Follow the top of the glade and we range into a new planting, just set, of rhododendrons, the wild species of our own mountains; its cousins, the pinxter flower and the kalmia now in flower; a foreign relation from Japan, *Azalea amvena,* etc. This old lane and its adjacent little inclosed vale close to the Cope Mansion will receive the many beautiful hybrid rhododendrons, the huckleberries, andromedas, and the other charming members of the Heath family. It will be termed as on the plan, "Rhododendron Vale." Most of our planting in this section of the park is inspired by a desire to use material happy under the existent trees, to replace the volunteer growth which is largely of arborescent species, too large in habit of growth and of a very great sameness throughout.

The section of the Arboretum to the west is introduced near Washington Lane Station by the Sapindales including the maple family, the buckeyes and continuing in the lower as the willows, birches, alders, poplars, and other swamp species. The beech family will some day clothe the hillsides at the northerly end of the charming valley and drift easily into the oaks, the hickories, the lindens, etc.

The planting of this section was begun last fall. There is a good beginning of a collection of barberries, eighteen species now being set, the sumacs, the spindle trees (*Evongonus*), calycanthus, tamarisk, oleasters, and some others.

The next development on this side of the Arboretum will be that of the aquatic section where the large willows are now seen. A splendid stream of spring water is to supply a goodly sized pond and a series of lagoons which we hope may display some water lilies, etc., and the moist ground nearby may contain the beautiful family of ferns, the swamp orchids, the sedges, cardinal flower, and a whole multitude of bog plants.

As to nomenclature, the plants have mostly been tagged already with zinc labels bearing the common name, botanical name (and authority), the natural habitat and also the date of planting and source from which the plant was obtained. No attempt has yet been made to label the old trees, but a form of label has been adopted and it is hoped that this summer will find this work under way. The system of naming is that which will be found of greatest advantage to average people and students, and nurserymen and the names adopted by the Committee upon Standardized Plant Names has been used. These are the terms found in most botanies and in the Cyclopedia of Horticulture by L. H. Bailey, which is perhaps the readiest reference work pertaining to this collection of ornamental species of plants.

It is hoped that members of this organization will report and send to the Arboretum any woody plants not in the collections and will encourage the undertaking by their scientific interest in the project. Your assistance can be of great value in many ways in encouraging the proper educational use of the place. It will some day be much visited we hope by the scientifically minded bird lover and plant enthusiasts as well as by him who likes beautiful landscapes, and needs quiet recreation.

ARTHUR W. COWELL.

STATE COLLEGE, PA.,
June 5, 1919.

STUDIES IN PROJECTIONS: ADAPTING THE HOMALOGRAPHIC PROJECTION TO THE PORTRAYAL OF THE EARTH'S SURFACE ENTIRE.

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In all our atlases and other geographic texts the commonest device in use for showing the earth's surface entire is Mercator's projection. And one of the most evil things we do in our teaching of geography is to put this projection before the eyes of our students, and keep it before them all their days. Like all other projections, this one has its merits as well as its faults, and for the sake of one or two advantages, we have been putting up with its faults for 350 years.

For it was in 1569 that Gerard Mercator, cartographer from the University of Louvain, published the famous "mappemonde" which bears his name. But Mercator did not intend it for use in the portrayal of land areas. It was invented purposely for use by the mariner, as an aid in laying his course across the seas. By this new projection Mercator made it possible for the mariner to draw a straight line from any point to any other desired point (the rhumb line, or route upon which his vessel will sail), and the angle between this line and a parallel of latitude gives him his course. It was truly a great invention—for the mariner. And for the purpose of a sailing chart no better invention has been made, and it will be used for all time by the marine interests, so far as we can now see. But most of the people in the world are land lubbers, and will stay so. And the need of laying a course is remote from their ken. Why should they be afflicted with this sailor's projection?

It is fair to say that Mercator's projection has held its own in popular use, because of some obvious advantages:

1. It shows the entire earth's surface (almost), in one continuous area.

2. Latitudes are represented as straight lines parallel with the equator, facilitating studies in comparative latitudes.

3. In very small areas, land forms are true in shape, because all parallels cross all meridians at right angles, the same as on the globe.

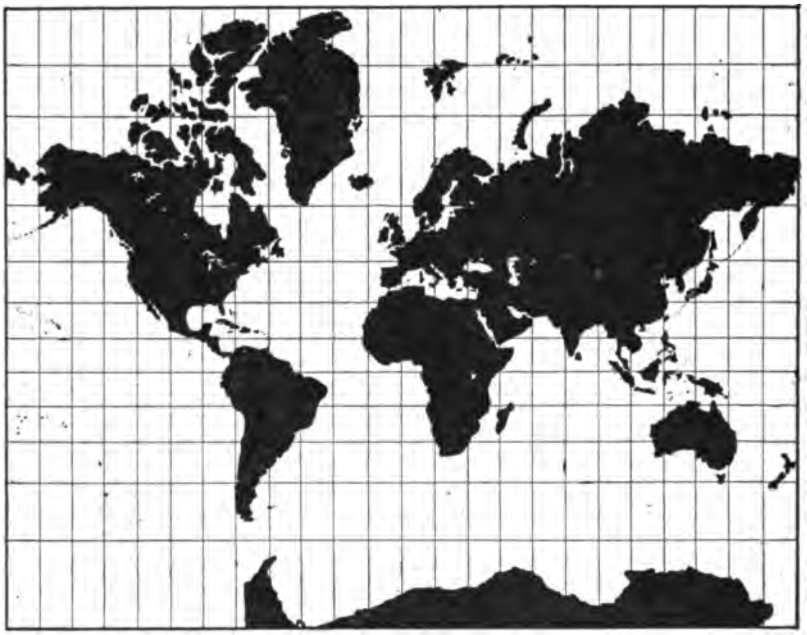

FIG. I. MERCATOR'S PROJECTION OF THE EARTH'S SURFACE.

But these three advantages are not pure and unalloyed. Like the platonic friends of Ferdinand, "some fault in them doth quarrel with the noblest grace they own, and puts it to the foil."

In the first place the projection does not show the whole earth's surface, nor is it physically possible to do so, since both poles of the axis are at infinity. And as to continuity of surface, it is not possible to have all the continents and all the oceans in view at once, even aside from the polar limitation just shown, without deploying considerably more than 360 degrees of longitude.

The second point, latitudes as straight lines trending with the equator, is the best virtue the projection has; and it is largely because of this advantage in reading comparative latitudes that it is used so much as it is.

In the third place, while it is true that because the parallels and meridians all cross at right angles, therefore very small areas are strictly true in shape, a very serious trouble enters, in that the *scale* changes with every change in latitude, growing larger with every increment of distance from the equator, at the same rate that the secant of the latitude grows larger, so that distances, and as a consequence, areas, are enormously distorted as we advance toward the poles. So from the point of view of showing the comparative areas, or even shapes, of continents, the map is a monstrosity. There are many projections better adapted to this service. The reason that it has been used so long unchallenged is that each new generation has inherited it without thought, as naturally as a Dane gets his blue eyes.

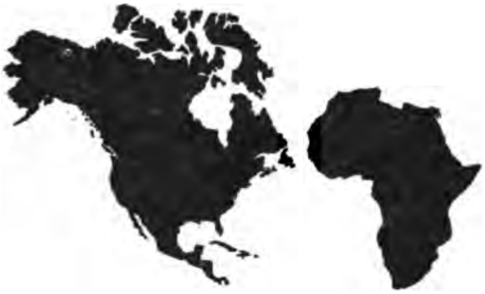

FIG. 2. NORTH AMERICA AND AFRICA FROM MERCATOR'S PROJECTION. North America *looks* very much larger than Africa.

Let us think about it a little, and see what its disadvantages are. The most inexcusable thing about it is that it tells such colossal lies about comparative areas. We learn by seeing, and when there is put before us a Mercator's map of the world, we see at a glance that North America is almost twice as large as Africa, yet when we look up the matter in a table, we find that North America has an area of 8.6 million square miles, and Africa 11.6 million. Now if we should happen to *think* about it, we should be confused about this conflict of authority, but seeing is believing, and we seldom think. So to the end of the chapter we are likely to remember North America as the next to the largest continent.

If now, some, or much of our teaching and study of continental relations could be done with the globe, or at least with an equal area projection, we might have fixed in mind the true relative size of the continents.

Bad as is the comparison of areas just given, the case is still worse when Greenland is compared with South America. If examined on the spot, perhaps most of the millions of educated people in the world would declare that Greenland is larger than South America. And were they to do so they would be true to the very effective teaching they have had.

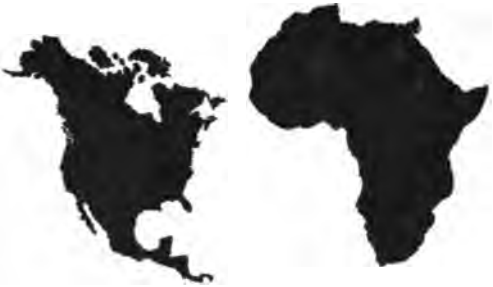

Fig. 3. North America and Africa Traced from a Globe. Africa *is* very much larger than North America.

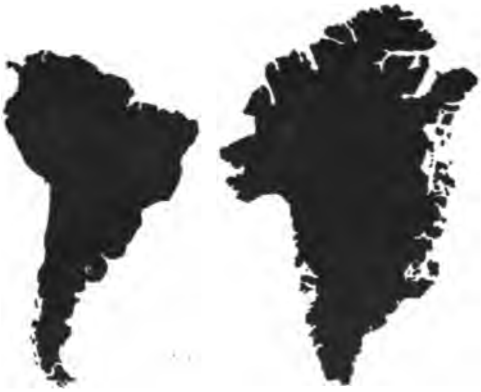

Fig. 4. South America and Greenland from a Mercator Map. Greenland *seems* much the larger.

The text will tell us that South America has an area of 7.6 million square miles, and Greenland, if we are fortunate enough to find it in the text, will be credited with only .8 million square miles. That is, South America is nine and one half times as large as Greenland. What a disillusionment it is, to bring together these two areas in their proper size, as we see them on the globe. We are shocked at the poor showing made by Greenland. But we can never be shocked enough to correct the evil done by the constant use of the Mercator in our education. And we go through life with this old monstrosity of a map in the background of our consciousness, just as we go through life saying the obvious thing, "the sun rises," though we know, of course, that it is not the sun, but the earth that rises.

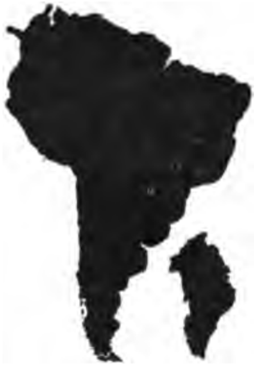

FIG. 5. SOUTH AMERICA AND GREENLAND TRACED FROM A GLOBE. As a matter of fact South America is nine and one half times as large as Greenland.

Now how does it happen that we have put up with this evil thing so long? Monstrosity as it is we are not offended at it. In fact we are rather comfortable in its presence. The explanation is simple, and well known. Pope long ago put it into rhyme for us:

> Vice is a monster of so frightful mein,
> As to be hated needs but to be seen.
> But seen too oft, familiar with her face,
> We first endure, then pity, then embrace.

We are *used* to it. That is the whole story. Many of us will be shocked to have the sacred old institution questioned at all, and will prefer to cling to it. That also is natural. We need not wonder at it.

Nearly all old people cling to their theories and beliefs, even after such beliefs have patently become dear old ruins. There is no hope for these people. As the prophet observed long ago, they must die in their sins.

But a little iconoclasm now and then may be relished by the most of men, and since all men are *born* free, the hope of the future lies in catching men early enough so that the new idea may be planted in them without too much pain, and may take root and grow. It is the purpose of this paper to introduce a better projection than the Mercator, for use in the study of most world relations.

It was in 1805 that the homalographic projection was published, in direct response to a demand for a projection which would present the surface of a hemisphere within the limits of a circle, without distortion of area. In this projection the radius of the circle is taken as the square root of 2, the radius of the sphere being unity. The equator and the mid-meridian are straight lines, at right angles to each other, and are diameters of the map. The equator is divided into a given number of equal parts, and through the points of these divisions, the meridians are drawn as ellipses. The mid-meridian is

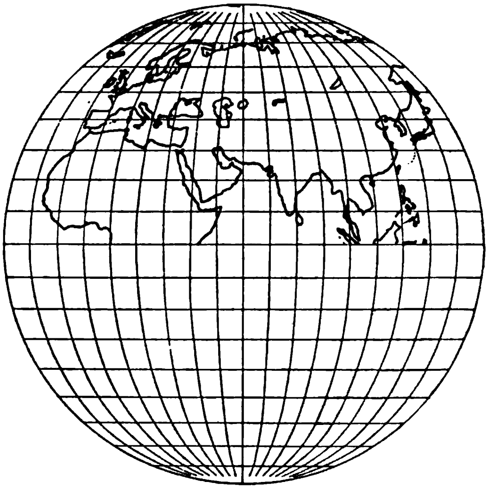

FIG. 6. HOMOLOGRAPHIC PROJECTION OF A HEMISPHERE. An equal area projection. Notice that the shapes of land and water bodies are good, near the equator and mid-meridian.

divided into the same number of parts as the equator, but these parts are unequal, being so computed as to be a little longer than the true distance in the lower latitudes, and a little shorter than the true distance in the middle and higher latitudes. Through these points the parallels of latitude are drawn as straight lines, parallel with the equator.

The distances between parallels are so chosen as to make any unit area of the map hold the *same* relation of area to an equivalent part of the surface of the sphere, as does any other unit area of the map. That is, a square inch anywhere in the map, represents the same number of square miles of the earth's surface, as any other square inch in the map. In other words it is an *equal area* projection. There is no distortion of area. This is a very great advantage. But there are other advantages. The rectilinear parallels of latitude offer the same advantage that the Mercator does, in the study of comparative latitudes. And in addition, this projection presents the earth's surface clear to the poles, a thing the Mercator cannot do.

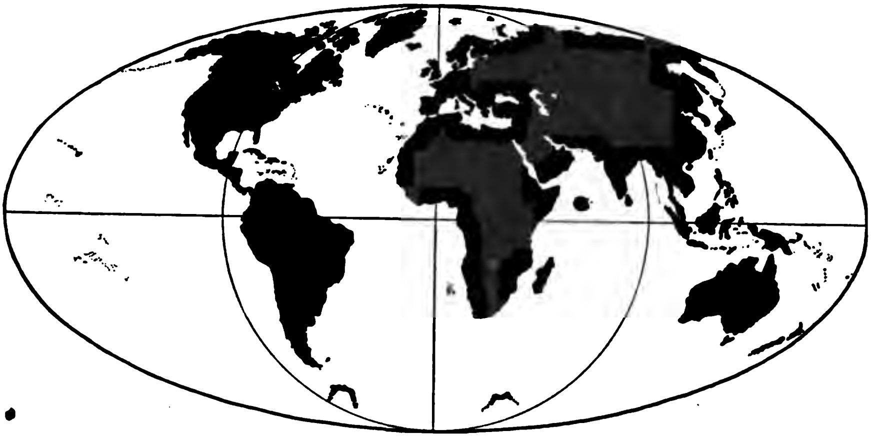

FIG. 7. HOMOLOGRAPHIC PROJECTION OF THE SURFACE OF THE WHOLE EARTH. An equal area projection, but with *shapes* badly distorted in the far quadrants.

This projection may be extended to include the entire earth's surface, in which case the map takes the form of an ellipse, the major axis of which is the equatorial circumference of the earth, and the minor axis the length of a meridian, that is, one half the circumference of a meridian circle.

Now while the equal area principle applies to all parts of this map as before, a very conspicuous fault enters, which practically destroys the usefulness of the projection. The fault is that this projection permits a progressive distortion of form, as one departs from the equator and the mid-meridian. This distortion is so great in the far quadrants as to make it almost impossible to recognize North America and Eastern Asia when they lie on the margins of the map. For this reason, this projection has been very little used where the whole earth's surface is to be shown. Where hemispheres are to be represented, and studies in comparative latitudes are not of primary importance, Lambert's azimuthal, or some other projection may be used, which will give a better form to the continents.

So it turns out that only occasionally has a geographer been brave enough to tolerate the unaccustomed distortion in shape of the continents, and has used the homolographic projection, so as to make use of the exceeding advantage of the equal area quality of the map.

Notice again that a considerable area next the equator and the mid-meridian have the forms of continents well reported, and the suggestion I am about to make will be apparent at once. Let us take liberties with this projection, and give each continent in turn the privilege of lying in the middle of the grill, where the best report is given on the shape of the continent, which the projection is competent to give. (See plate I.)

Thus for North America the meridian of 100° West presents the continent at its best. For South America the longitude of 60° West gives it a form almost as good as any projection can give. For Africa, 20° East (south of the equator) becomes the mid-meridian, while Africa north of the equator joins with all Eurasia in one great lobe, which I have chosen to center upon longitude 60° East. In this wide lobe shapes are quite badly distorted in Greenland and far eastern Siberia. But in the case of Greenland, a bit of overlap on the North America lobe brings it closer to the mid-meridian, and gives it a more comfortable shape. The choice of 60° East gives fairly good shapes to the more important parts of

Eurasia, though it might be better to poise it on 50° or even 40° East, so as to have less distortion in shape in Europe. But for the continent as a whole the shape here shown is almost as good as any projection may give. The final lobe, Australasia, is conveniently balanced on 150° East, giving a very good Australia.

The homolographic projection, as here given, presents the whole earth's surface, which the Mercator cannot do. It has the superlative advantage of being an equal area map, in which each sea, island, continent, or country is shown in its true relative size. It gives each continent in turn the middle of the stage as it were, where it has the best the projection can give in the matter of form. And finally, it gives us the very large advantage of having the parallels of latitude as straight lines, trending with the equator, just as the Mercator does.

Upon this interrupted projection all distributions of whatever data, on continents as units, can be better shown than on any other projection hitherto in use. The Mercator projection for such purposes should be discontinued.

The supreme advantage of this projection, however, is patent, when a density distribution per unit area is to be shown. It is an absurdity to enter upon a Mercator, areas of dense or scant rainfall, or forest or grazing areas, or wheat or other crop per square mile, or population density, or any other density datum. This absurdity may now be avoided by entering such data upon the homolographic projection, interrupted for continent unities, where land distribution is desired.

The discussion so far has provided for continents only. But it is quite as easy to interrupt the homolographic projection to throw the oceans into units. For this purpose the middle latitude of each ocean is chosen for the mid-meridian of the ocean lobe. But as the Atlantic and Pacific oceans are not symmetrical on opposite sides of the equator, the north Atlantic is balanced on 30° West, and the South Atlantic on 20° West. In like manner the South Pacific is given a lobe centered on 140° West, and the North Pacific on 170° West. The Indian Ocean lobe is centered on 90° East south of the equator, and 60° East north of the equator.

At first glance it seems somewhat murderous to cleave our continents down to their very toes, but this merely shows that most of our study and interest are centered in the continents. If we will

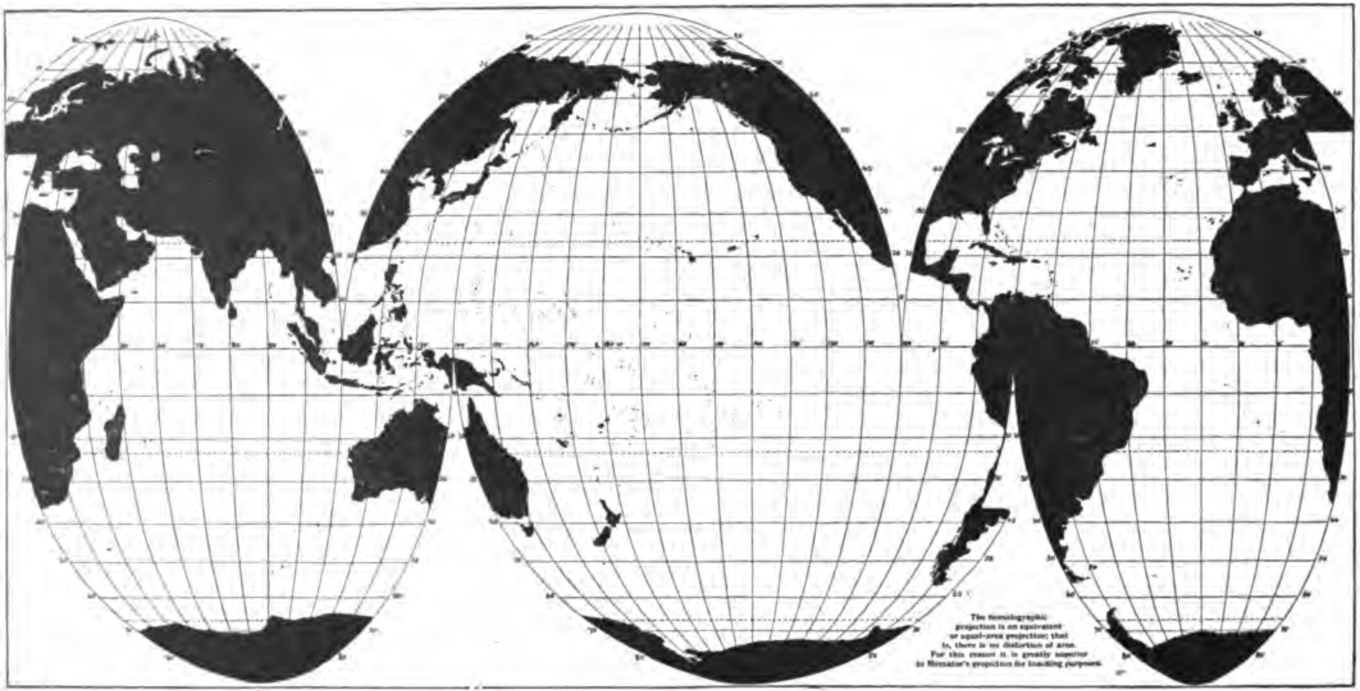
The homolographic
projection is an equivalent
or equal-area projection; that
is, there is no distortion of area.
For this reason it is greatly superior
to Mercator's projection for teaching purposes.

FIG. 9. HOMOLOGRAPHIC PROJECTION INTERRUPTED FOR OCEAN UNITS.

forget the continents, when we are studying oceans, we will discover that this plan of interrupting the homolographic projection to give the oceans for once, the center of the stage, provides us with the best map of oceans yet presented. For each ocean is given entire, and without distortion of area, the relative sizes of oceans being shown perhaps better than one may see them on the globe, since they are all before the eye at once.

Upon these oceans, because of the advantage of rectilinear parallels of latitude, all sorts of data may be laid down with profit. Sailing routes from London or New York may be laid to any port in the Atlantic, and via Panama to any port in the Pacific and Indian oceans without a break. Upon this chart ocean currents, the salinity of the ocean, tidal waves and other phenomena can be shown, without distortion of area in high latitudes or any latitudes, and with almost no variation in distance, from true values on the globe. For once the relation of the two sides of the Atlantic is shown as it should be, with the shortest route between Newfoundland and Ireland.

To sum up, there is offered in the homolographic projection, by means of this scheme of interruptions, a base map of the whole earth's surface, which offers practically all the advantages of the Mercator, for most of the uses to which the world map is put. It is a map which is far superior to the Mercator, and which makes it unnecessary from now on to impose upon the student the enormous distortions of distance and area, which are the principal fault of the older projection. Nor is there any particular fault in the new map proposed, which stands in the way of the best teaching. The ease of study in comparative latitudes is maintained. The whole earth's surface is shown. The continents and the oceans are given better form than is possible in the older map. And best of all, the truth is told about areas. In fact more truth and less error are presented in this modification than in any alternative projection which presents the earth's surface entire.

May 13, 1919.

BOOK REVIEWS.

Boerker, Richard H. D. *Our National Forests.* A Short Popular Account of the Work of the United States Forest Service on the National Forests. New York, The Macmillan Co., 1918.

The ever-increasing importance of the forestry movement in this country, which brings with it an ever-increasing desire for information along forestry lines, has led the author to prepare this volume dealing with the National Forests. The author has drawn from his own experience, having been connected with the United States Forest Service in various parts of the West. The book is a chronicle of a wonderful accomplishment, viz., the creation of the National Forests. The book is rather a remarkable one from the standpoint of typography because the preface, introduction, table of contents and list of illustrations occupy 69 pages of the book, as noted below, while the descriptive part of the book makes up only 238 pages. It is rather an unusual feature to find the table of contents, etc., about 50 pages from the title page of a book. The eighty figures are well chosen and add value to the detailed treatment of the author in the introduction and pages of the text. That the preservation, use and perpetuation of our forests is a national problem is proved, when we consider our consumption of wood and lumber, the maintenance of the flow of our streams and the erosion which takes place with the denudation of our hill slopes of forests. The national forests were created to do the greatest good to the greatest number of our people, and in accomplishing this, a broad policy of forest administration has been adopted, so that the perpetuation of our forests has been assured through regulation of the cutting of trees, the control of forest fires and the prevention of unwarranted trespass by sheep owners and the public at large. The beneficial results have been more than the financial returns from the sale of timber, for a permanent, not a temporary civilization has resulted. The beneficial effects of the establishment of western national forests has been extended to the east by the purchase of timber tracts in the White Mountains and in the southern Appalachians.

This book on "Our National Forests" treats in detail of their creation and organization with an historic statement of the fact that the first forest reserves were established March 30, 1891, when President Harrison by presidential proclamation created the Yellowstone Park Timber Land Reserve. The author treats of the administration of the National Forests under the heads of personnel, appropriations, equipment, improvements, classification of lands, planting, organization and scope of forest experiments and investigations. The third section of the book deals with the protection of the National Forests from fire, trespass, forest diseases (insects and fungi), erosion, etc. The use of our National Forests is considered under the caption "The Sale and Rental of National Forest Resources."

The book is to be commended to those persons who expect to visit the National Forests under the encouragement given by the United States Railroad Administration by the issuance of cheap railroad rates and attractive literature setting forth in detail the best and most interesting routes of travel.

John W. Harshberger.

Burroughs, John. *Field and Study.* Pp. 330, frontispiece. Boston and New York, Houghton Mifflin Co., 1919. $1.50 net.

At eighty-two, Mr. Burroughs is still observing, reflecting, writing, with more than a score of books to his credit. This latest of his volumes is almost an epitome of his range of thought. It begins, as does "Wake Robin" (the first of the long series), with a loving account of the spring bird procession; it ends with a sheaf of miscellaneous notes. Between the beginning and the end of the book are discussed the ways of birds, beasts and insects, literature, religion, science and evolution.

Scarcely one of Mr. Burroughs's pet subjects is omitted from "Field and Study." Naturally birds occupy an exceedingly prominent place. Above all other things the master of Woodchuck Lodge in the Catskills is a bird-lover. The old favorite subject of instinct receives some new light in regard both to birds and to insects. Wordsworth, Emerson and Thoreau reappear, and what book of John Burroughs would be complete without a special pæan of praise for Walt Whitman? The keen observation, the apt simile, the vast store of experience, delight the reader as in preceding volumes. Mr. Burroughs's felicity of phrase is a frequent pleasure to those who turn these pages. "Wait long enough and Nature will always have a fresh surprise for you." "No wild creature comes amiss, even though it rob your henroost." "It is not easy to fathom Nature's inconsistencies." "My science is as unprofessional as my religion." Such sentences have the ring of Holmes or of Emerson.

Along with this clean-cut diction goes a matured mellowness of thought, a sympathy with the wild life of field and wood, that is not so clearly manifest in Burroughs's earlier books. At one time it was difficult for him to lose his pose as the well-informed observer, who reported the doings of bird and beast with ever in the background a thought of his own cleverness; but this has ceased to be felt.

The only fault of the book, strangely enough as regards an author who can clothe his thought in such fitting words, is a literary one. The chapters end as though chopped off with an axe; there is no relief from the sudden bump which announces the finale. Is this a wilful disregard of rhetorical values, or an insensibility to the real harmony of composition? The inclusion of so many short disconnected notes is a feature which betokens the same failing. The charm of this volume, however, surmounts such small objections and adds fresh credit to the fame of a naturalist who holds a unique position among our writers.

Walter Lefferts.

Butler, Ralph. *The New Eastern Europe.* Pp. 176. London and New York, Longmans, Green and Co. 1919.

The political and economic factors underlying the present situation in each of the new states that now form the borderland between Russia and Central Europe are analyzed by Ralph Butler with clearness, precision and a keen sense for the varying human equation. Especial emphasis is laid upon the interaction between Nationalism and Socialism. In Poland the political movement dominates; in the Ukraine, the economic; while in Finland the two are in conflict. The future of these three states as well as of Lithuania and the New Balticum seems largely dependent upon their solution of agrarian problems, the extent to which the peasantry is given the land. Poland not only has industrial in addition to agricultural difficulties to deal with but also presents a particular element of uncertainty in the character of her people. Exceptionally gifted and most attractive, the Poles are strangely unfruitful in the political sphere. They are of those artists whose conceptions are brilliant but who never finish their work. They seem to lack "that feeling for the essential and the unessential which is at the root of political aptitude." A strong Poland is needed in Eastern Europe. Changes in the map and assistance from the League of Nations are turns of diplomatic machinery that may improve the environment of the new political organism, but its strength and its stability must come from within.

A. L. L.

Young, S. Hall, D.D. *Adventures in Alaska.* Pp. 181. New York, Fleming H. Revell Company, 1919.

This book is exactly what its name implies; a series of more or less independent stories of life and adventure in Alaska, designed by the author for "healthy-minded young people." Its interest is, however, by no means confined to these; for any grown-up who reads the book and is not thrilled by the straightforward tales, with their really brilliant description, their bold character sketching, and the true literary skill displayed in the selection of subject matter, would be anything but healthy-minded. The deeper purpose of the book seems to be to reveal to those who can look beneath the surface of things the value of real manhood and the splendid achievements of the right kind of missionary effort, despite the strictures of Mr. Stefansson.

The author is an out-door man who, independently of his calling, loves the wilderness and his touching tribute to his dogs reminds us that it was once literary gossip that one of Dr. Young's writings furnished to the late Mr. Jack London somewhat more than the mere suggestion for "The Call of the Wild."

By no means the least happy of Dr. Young's delightful pages are those in which he makes merry reference to a certain distinguished member of the Geographical Society of Philadelphia.

B. W. Mitchell.

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The BULLETIN of the GEOGRAPHICAL SOCIETY of PHILADELPHIA

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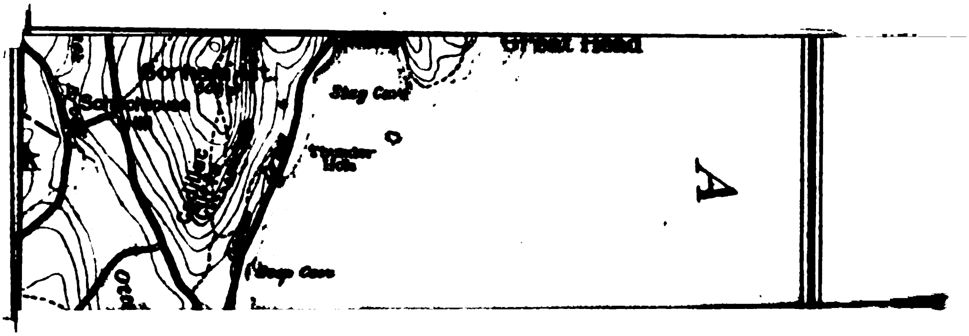
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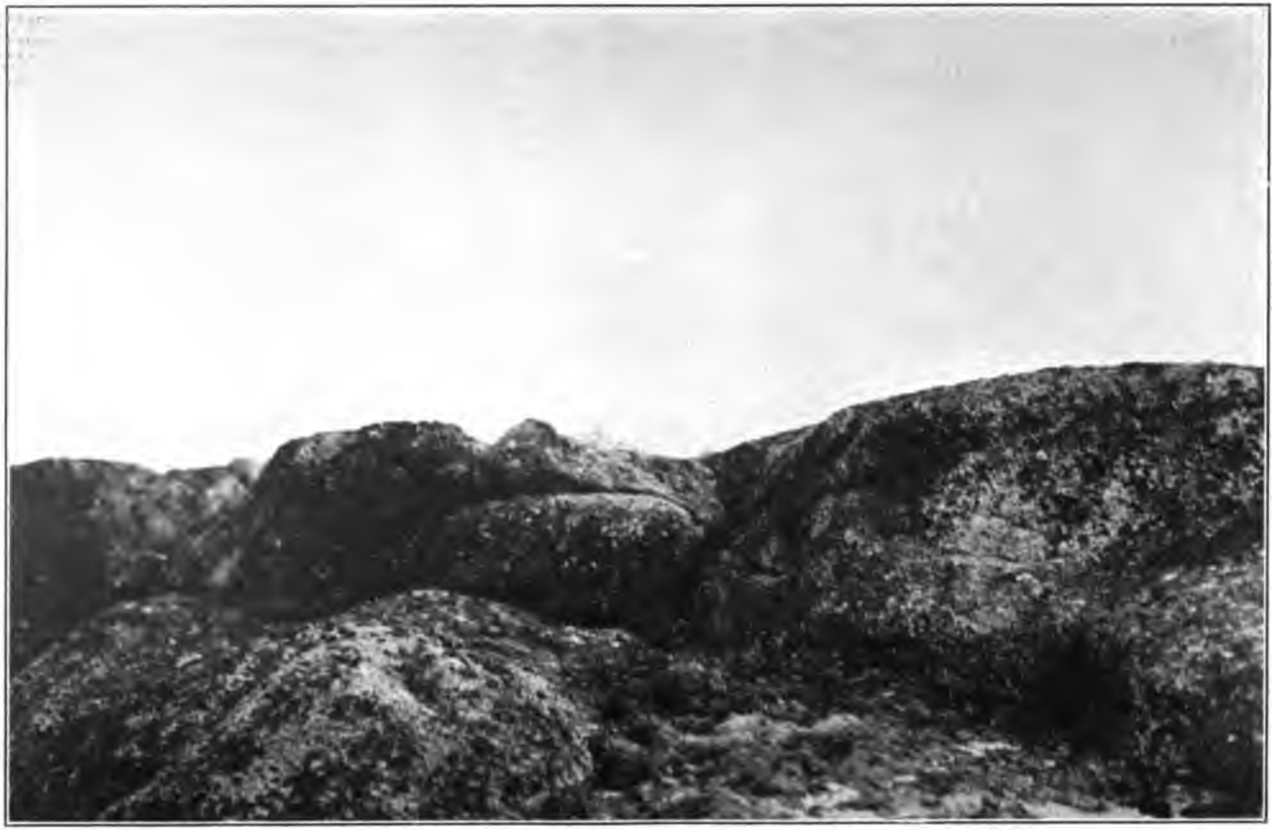


Glaciated Summit of Sargent Mountain, Mount Desert.

Frontispiece.

THE PHYSIOGRAPHY OF MOUNT DESERT.

F. BASCOM.

Mount Desert, the largest island among several hundred on the New England coast and comprising the highest land on the Atlantic seaboard, is a region of superb natural charm and great physiographic and geologic interest.

The location of the island is such—at about 68° longitude and 44° latitude and facing the open ocean only on the south—that the cool temperature normal to the latitude is modified by the sea, winds and moisture are tempered by the mainland, and an ideal summer climate is created. Nearly circular in outline, with a radius of about six miles, Mount Desert comprises approximately one hundred square miles.

The most obvious topographic feature of the island is a highland, trending nearly north and south, and sloping gently on the north side and more steeply on the south side. This ridge is cut into mountain peaks by nine transverse parallel valleys, which trend therefore nearly north and south. The highest summits are at the northeast end, where the altitudes range from 1,300 to 1,532 feet above the sea, declining in the southwest to altitudes between 970 and 1,000 feet.

These features record a somewhat extraordinary physiographic history which is involved in the geologic history of the island.

Geology.[1]—The great mass of Mount Desert is composed of granite. The highland ridge, its mountain peaks, and southeast and northwest flanks are granite rock. Clark Ridge, Southwest Harbor, and a narrow peripheral coastal margin are made up of other kinds of rock.

The granite is a handsome, medium-grained, pink and white rock, with three or four conspicuous mineral constituents: the colorless glassy constituent is quartz, the pink mineral with lustrous surfaces is orthoclase and microcline (feldpars), the opaque white mineral is a plagioclase feldspar, usually oligoclase, and the dark-colored constituent is either a lustrous brownish black mica or a less lustrous greenish black hornblende. The rock is very uniform in character, varying only on the peripheral contacts, where it is finer grained and lighter colored owing to the absence of red iron oxide in the feldspar.

---

[1] See Shaler, Nathaniel Southgate: Eighth Annual Report, United States Geological Survey, 1886–87. Part 2. "The Geology of the Island of Mount Desert," pp. 987–1061—with plates and 26 figures in the text.

The United States Mint Building, in Philadelphia, and the new bridge over the Potomac at Washington are built of this stone, obtained from large quarries on the west side of Somes Sound in the neighborhood of Hall Quarry P. O.

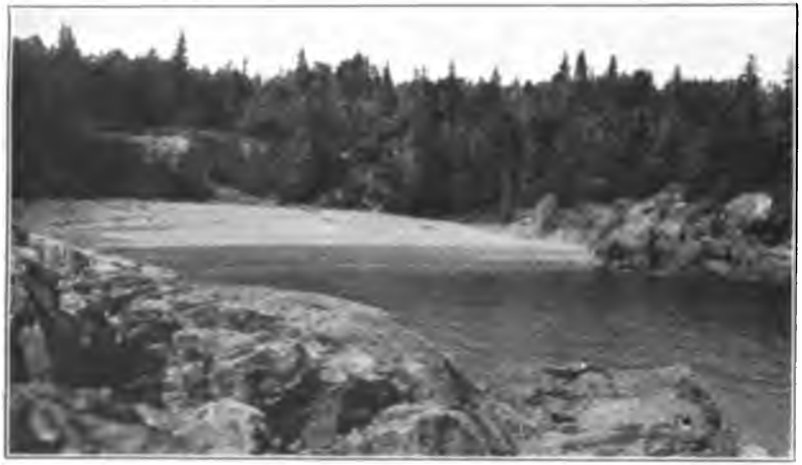
The granite has been described first, because it is the conspicuous and dominant rock of the island, but it is not the oldest rock. It is on the contrary, with the exception of some trap dikes, the youngest formation of the island and has been an intruder into the older sedimentary and igneous rocks. The proof that the granite was a later intrusion into rocks earlier consolidated is found in three phenomena:

1. Dikes from the great mass of granite penetrate far into the surrounding rocks. Such dikes compose a large part of Sutton Island.

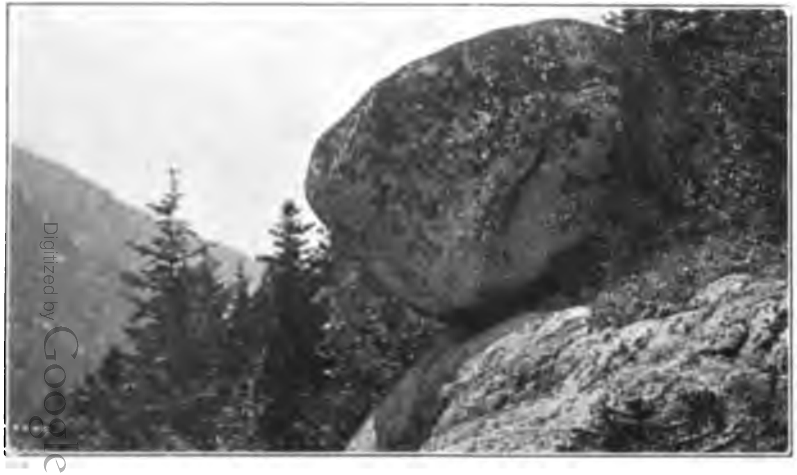
2. A breccia, which is made up of fragments of other igneous rocks imbedded in a granitic cement, occurs in some places along the contact of volcanics and granite. A breccia of this sort is a striking formation on the west side of Hunters Beach Cove. (Fig. 1.)

3. The granite is distinctly finer grained near the contacts with the intruded rocks wherever such contacts are exposed. This would be the case if the molten granitic magma were chilled by the proximity of a cold wall rock. The more rapid cooling of the marginal magma thus brought about would not give sufficient time for the growth of crystals of the size prevalent in the main body of the rock.

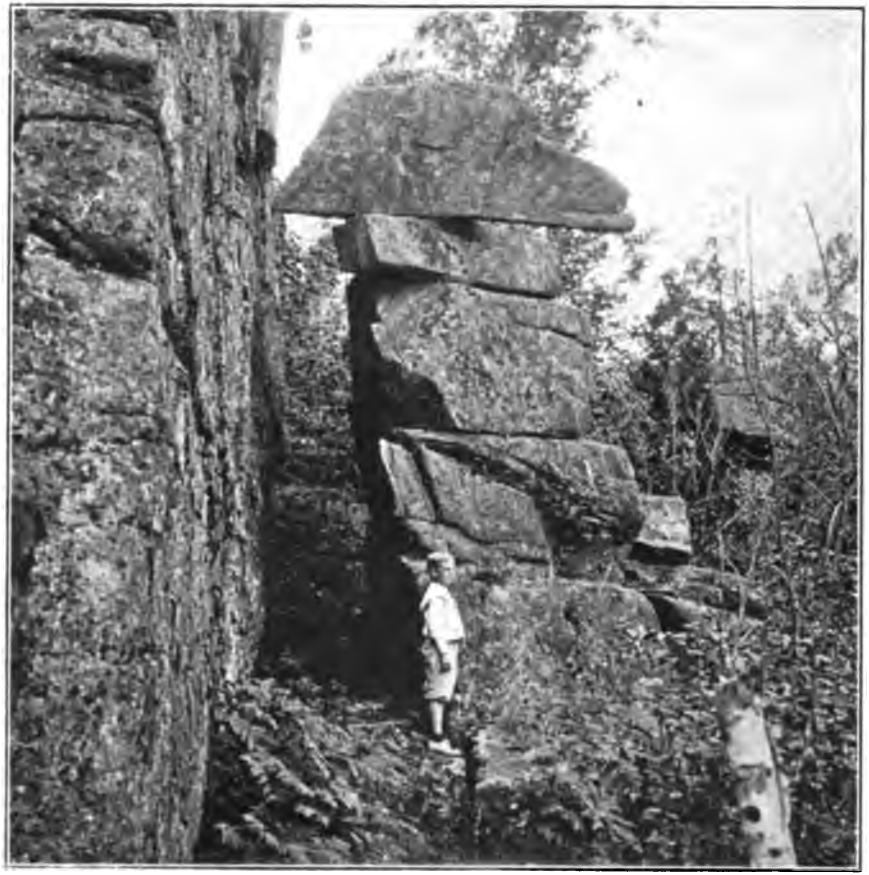
Pregranitic Rocks.—The oldest rocks of the island are a series, 2,000 feet or more in thickness, of green schists and quartzites, which fringe the west side of Mount Desert. Appearing first at Dix Point, they trend north and northeast to Thomas Bay, dipping east and southeast. They compose the western two thirds of Bartlett Island and have therefore been called the ***Bartlett Island series.***



HUNTER BEACH COVE, SOUTH SIDE MOUNT DESERT.
Breccia on left.
FIG. 1.



BALANCED ROCK, SOUTH BUBBLE, MOUNT DESERT.
FIG. 2.



CHIMNEY ROCK AT THE CLEFT. A stack detached by wave action.
FIG. 3.

On the east side of Mount Desert, south of Bar Harbor and extending from Cromwell Cove to Newport Cove, there is exposed a narrow belt of schists and slates which resemble the Bartlett Island series but are less metamorphosed. They trend nearly parallel to the coast line and dip away from it, thus offering the minimum resistance to wave action. They are presumably of the same age as the Bartlett Island series, but as this cannot be proven because of their discontinuity and the absence of organic remains, they are given a different name, and are called the *Schooner Head series,* from the headland in which they are finely exposed.

Perhaps the next oldest formations of Mount Desert are the stratified rocks skirting the north and east shores of the island from Thomas Bay (east side) to Cromwell Cove at the southeast end of Bar Harbor. These are chiefly quartzites, slates, and flagstones, red, purple, and green in color, 700 to 1,000 feet in thickness trending north and northeast with a gentle south dip. They are not very highly metamorphosed but no organic remains have as yet been found in them: it is possible that some of them under more thorough study might prove to be volcanics. They are well exposed at the Bar Harbor landing and have been named the *Bar Harbor series.* At the Ovens, just east of Sand Point, there appear massive fine-grained felsitic intrusives or volcanics which are exposed from the Ovens to Salisbury Cove.

Younger than the Bartlett Island and Schooner Head series, possibly contemporaneous with the Bar Harbor igneous rocks, and next in age to the granite, are the rocks that fringe Mount Desert on the south, known as the *Cranberry Island series.* They appear at Otter Creek Point, Hunters Beach (east side) Ingraham Point, East Point, Dodge Point, Pierce Head, Northeast Harbor, Southwest Harbor, where they cover a considerable area, and form Sutton Island and Little and Great Cranberry Islands. They consist of about 100 feet of flagstones underlying 2,000 feet of volcanics; quartz porphyries, amygdaloids, breccias, volcanic ash, etc. They dip steeply south and southeast or are nearly vertical.

Dikes.—(*a*) The oldest intrusive rocks are the dikes connected with the volcanics of the Bar Harbor and Cranberry Island series. These are porphyritic, are limited to the periphery of the island, are found only in the neighborhood of the lavas and do not intrude the central granite mass.

(*b*) The great intrusive of the island is the granite mass which has been described and which is essentially a short broad dome-like dike, cutting across the bedding of the sedimentaries and sending many offshoots into them. Baker Island granite is the largest of these offshoots from the main mass. Nutter and Dix points show another large offshoot. Smaller dikes from the central mass are plentiful everywhere along the contact between the granite and the adjacent sedimentaries.

(*c*) A third class of dikes shows the dark green color and fine-grained texture of the rock popularly known as trap. Such dikes are numerous, cut indiscriminately all the formations, not excepting the granite, and are manifestly the youngest rock of the island. They traverse the granite parallel to joint planes, are less resistant to weathering than the granite and their decay gives rise to narrow gorges or "chasms." Beech Hill road makes use of a gorge of this origin and others will be mentioned later. Dikes of this kind may be seen between Hunters Beach and the Champlain Monument.

(*d*) Near the Champlain Monument a conspicuous white quartz vein strikes southeast toward the sea. Similar quartz veins occur elsewhere on the island.

In the pre-granitic sedimentary series aggregating some six thousand (and presumably more) feet, the absence of limestone or calcareous deposits of any kind is noteworthy. No fossils have yet been found on the island and this non-calcareous character of the deposits is therefore the only clue to their age and on this ground they are referred to the base of the geologic column (Lower Cambrian or earlier).

The pre-granitic volcanics are somewhat younger and resemble similar volcanics to the south on Fox Island which have been referred to a later age (Silurian, Niagaran).

When the granitic intrusion occurred, there must have been a considerable thickness of sedimentary and volcanic rocks above the cooling granite. Thus only can the coarseness of the crystalization be accounted for. The fluid condition of the granite at the time of the intrusion is shown by the way in which it has penetrated in narrow dikes the fissures of the wall rock and by the way in which it has cemented fragments of the volcanics.

Glacial Deposits and Glaciation.—Bare rock is exposed on Mount Desert near sea level between low tide and the highest level reached by high tide, and on the mountain summits and slopes above the general level of 600 to 700 feet. (Frontispiece.) Between these two levels, high tide and 600 feet, the rocks are covered by a mantle of loose material known as drift, mixed with a scanty soil composed of decayed rock and vegetal matter.

"Drift" comprises all the loose material not derived from the immediately underlying rock. It may be stratified, or unstratified (till), irregularly distributed, and heterogeneous in the character and size of its components. This peculiar rock mantle is a deposit of the ice sheet which once covered the island.

Above 400 feet there is scanty drift, and scattered "erratics" or glacial boulders of considerable size dropped by the ice. That these boulders were lodged by the melting of the ice, is indicated by the altitude above stream valleys at which they are found, and by the unstable positions which some of them occupy and in which they would not be lodged by a flood sufficiently powerful to have transported them; that they were not formed by weathering, in place, of massive rock is indicated by their lithologic character which is usually unlike that of the rock upon which they rest and from which they could not therefore be derived by disintegration.

"Balanced rock" on South Bubble is one of many such erratics (Fig. 2), and on the summit of Jordan Mountain there is a conspicuous erratic of considerable size.

Between 400 and 200 feet altitude the coarser material is replaced by stratified sand and gravel in the valleys and below 200 feet by stratified clay which extends in the coves to sea level and, except for an occasional exposure in a roadside section, may be concealed beneath a cover of till. Wherever the clay is absent the lowland is covered by till. At the south end of Jordan Pond, a rock-bound basin, a thin covering of till overlies the rock and is in turn overlaid to the south by stratified sand and clay.

Of other glacial deposits there is very scanty evidence. The hummocky gravel hills which have been utilized for burial grounds, on the west side of the head of Bass Harbor, at the head of

Quahalig Pond (Squid Cove) and northeast of Petty Marsh Harbor, and between Somesville and Echo Lake (Dennings Pond), are glacial stream deposits known as *kames.*

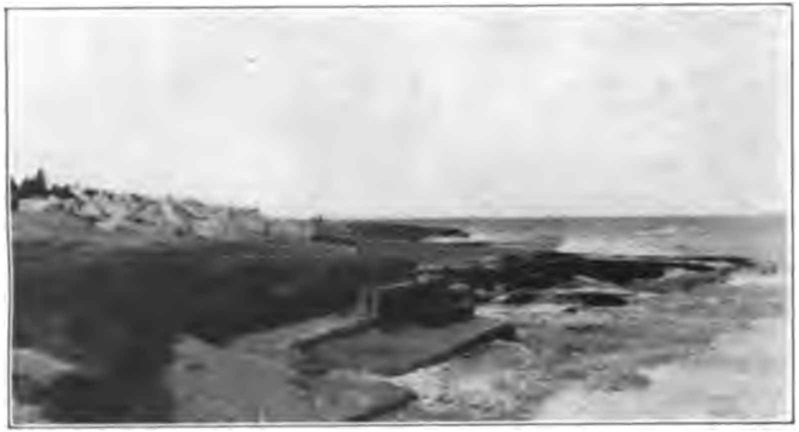
North of Browns Mountain and east of Seal Cove (Sargent Cove) on the east side of the road leading from Northeast Harbor to Somesville, there are irregular heaps of glacial boulders which would repay study. Some of the material came from the northern end of the island and the accumulation may be morainic in character. If this is the case, similar heaps of boulders in alignment with these should be found.

That the glacial ice covered the mountains to a considerable depth and moved southward is clearly shown in the erosion, polishing, grooving, and striation of the granite.

Physiography.—The contour and topography of Mount Desert are profoundly affected by a pronounced structure in the dominant rock of the island. This structure is known as jointing and consists in the presence of parallel planes of parting spaced a foot or more apart. There is a system of joint planes dipping gently southeast, and becoming nearly horizontal at the extreme southern exposures of the granite. Perpendicular to these joint planes are two systems of vertical joints trending in nearly north-south and east-west directions. Of these two systems the north-south joints are the more strongly developed. All three joint systems are magnificently developed in the granite of Baker Island where they control the character. of the sea erosion. By means of them the rock is readily split into gigantic cuboidal or parallelopiped blocks which are sucked out by storm and tidal waves and piled high on the shore like quarried stone. (Fig. 4.)

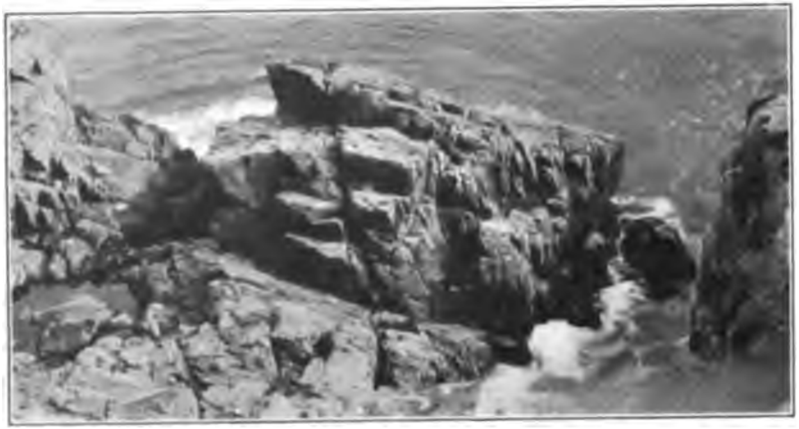
Because of the roughly circular form of the coast line the joint planes face the sea at varying angles and the character of the sea work is determined by this angle. Joint planes sloping toward the ocean resist wave actions and are not easily cut back into high sea cliffs. In any other position, sloping away from the sea or horizontal, jointing assists in the development of high sea cliffs. Vertical jointing at right angles to the shore line gives rise to deep indentations of the coast line parallel to these joint planes. (Fig. 5.)

On Mount Desert the nearly horizontal joint planes slope toward the open sea on the south, and north-south vertical joints are a



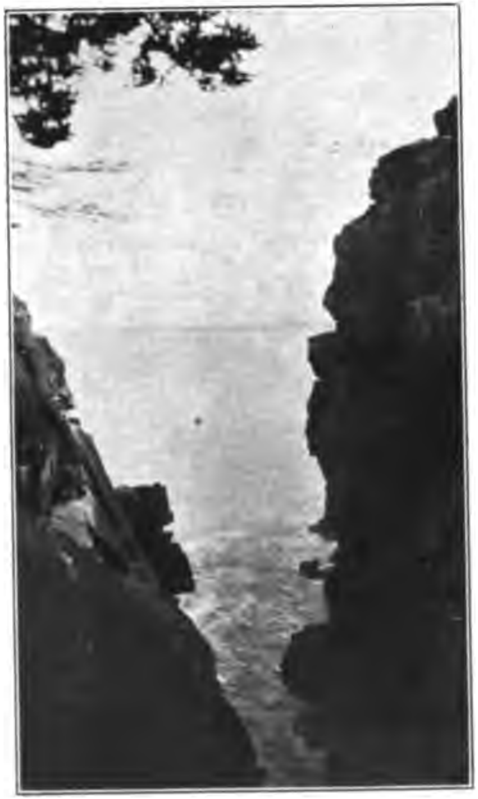
Seaward Side of Baker Island.

Fig. 4.



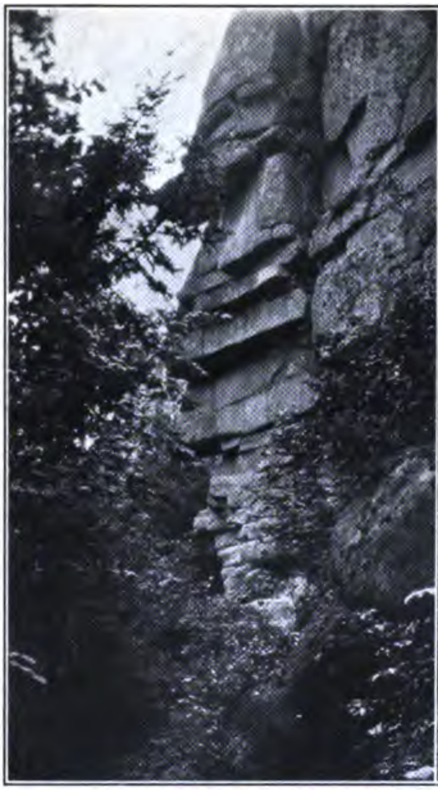
Joint Control of Sea Erosion.

Fig. 5.

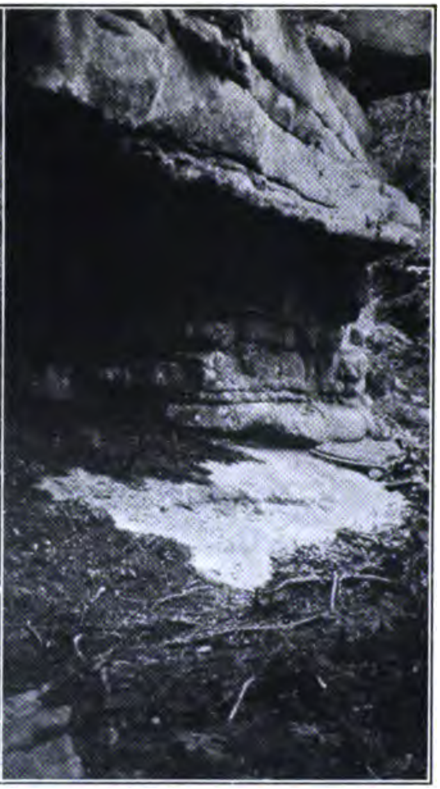


Chasm Due to Sea Erosion. At Otter Cliffs.

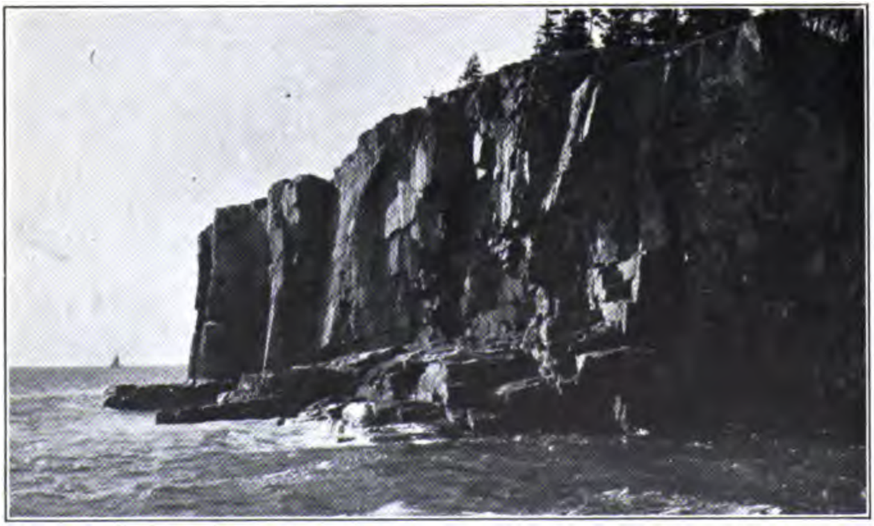
Fig. 6.



Cardillac Cliffs, Gorham Mountain.
Fig. 7.



Sea Cave at Base of Cardillac Cliffs,
Gorham Mountain.
Fig. 8.



Otter Cliffs at Present Sea Level, South of Cardillac Cliffs.
Fig. 9.

dominant structure. Under these conditions a cliffed, unindented coast line has developed on the east and an uncliffed, indented coastline on the south.

The causal association of dikes, joint planes, and valleys is also conspicuously illustrated in the nine remarkable transverse valleys already mentioned.

They are remarkable in their number and parallelism,—nine parallel valleys in a distance of twelve miles. They are remarkable in their longitudinal profiles: some of them are lower in the middle than at their outlets; Somes Sound, Echo Lake, and Long Pond have such profiles. They are remarkable in their cross profiles, which are narrow and deep.

The location, number, and parallelism of these valleys are undoubtedly owing to the control of stream courses by vertical jointing and by dikes in the granite, and their remarkable profiles are owing to ice-work.

Joint planes offer lines of least resistance to drainage, and dikes intruding parallel to joint planes, which offer also lines of weakness to the intruding molten rock, are not only less resistant than the granite but they render the granite in their immediate neighborhood more accessible to disintegration; by their chemical action, by the multiplication of joint planes, and by their own disintegration.

The valley between Beech Mountain and Canada Cliff (Echo Mountain) through which passes the road from Carter Nubble to Norwood Cove has its origin in the erosion of a dike which occupies the center of the depression. The dike is about 10 feet wide. The valley is more than 200 feet deep and owes its width to the easy access to weathering which the presence of the non-resistant dike gives to the adjoining much jointed and altered granite. This valley is an illustration of the conditions determining the erosion of the other valleys, where conditions cannot be so readily observed.

In the erosion of any recently emerged land surface, the runoff is at first concentrated in *many parallel* channels of which later one or more become, because of greater ease of erosion or steeper slope, the master channels and control by the more rapid deepening of their valleys the courses of the other originally parallel streams, thus developing normal dendritic (tree-like) drainage.

In the case of Mount Desert, rock structure and ice work combined to prevent the development of such normal dendritic drainage. The stage of parallel valley growth became a permanent condition owing to joint control and in this condition the island was overridden by the ice, which, converging in the valleys, over-deepened their upper middle courses, forming the rock-bound lake basins, and further deepened the lower courses.

The more gentle northern slope with post-glacial dendritic drainage lines has its origin in general ice erosion which obliterated the preglacial valley heads; the southern or lee side of the mountain received less erosion than the northern or shock side. Subsequent sea erosion and stream work have doubtless also been factors in steepening the southern slopes.

Post-Glacial Land Movements.—In order to read the record of land movements, it is necessary to observe the work of the sea on the present shore line. Characteristic features of a rocky coast, such as Mount Desert presents, are either (*a*) sea cliffs, sea caves, and a bench bearing cliff debris on its outer slope, the region of relatively still water; or (*b*) chasms or coves of greater or less width bearing a sand and pebble beach in their reëntrant (*i. e.*, protected) angles.

Whether cliff or beach is developed will be, as has been indicated, chiefly dependent, the rock remaining the same, upon the slope of the rock with reference to the sea and the position and number of the joint planes and dikes. With horizontal or vertical planes of parting and few or insignificant dikes; sea cliffs, sea coves, and benches, with cliff debris swept to the outer slope, will develop. Anemone Cave and the overhanging sea cliffs of the east coast of Mount Desert are examples of sea-work under such conditions.

With the planes of parting in the rock dipping toward the sea, a structure offering maximum resistance to wave work, sea caves are not likely to form nor do high sea cliffs develop. The south shore of Baker Island facing the open ocean shows this condition. In general the south coast of Mount Desert, although facing the open sea, is notable for the absence of cliffs and caves while the east coast is characterized by the presence of bold cliffs (Fig. 9) and deep caves, a difference due to the slope of the rock in relation to the sea.

Where dikes are numerous or wide with perhaps a concentration of vertical joint planes, hallways or "chasms" (Fig. 6) will develop and where such chasms possess considerable breadth, a beach is formed in their protected angles. Hunters Beach cove is a typical example of many such beaches on the Mount Desert coast, and of such nature and origin are the harbors on the south coast. (Fig. 1.)

If at heights now above sea level such phenomena as these are found at fairly uniform elevations, it is a fair inference that the sea at one time stood at these levels and produced the features which are so characteristic of sea work at the present shoreline and which are not known to be exactly imitated by any other agents. There are briefly such sea cliffs, sea caves, and terraces at the following levels, omitting the more faintly defined benches such as exist at the 20-foot, 40-foot, and 60-foot levels. It is noteworthy that these cliffs and caves face the east as do the cliffs and caves of the present shore.

1. *90 to 100 feet.* This bench is best seen on the east side of Seal Harbor and at Newport Cove, where the slight cliff and slope of the old shore is very characteristic of sea work.

2. *165 to 200 feet.* Dodge's Ledge at Seal Harbor is a good example of the sea cliff at this level, with cavern-like recesses at its base retreating nearly 20 feet, fronting a smooth sloping rock terrace swept clear of glacial till and with an accumulation of sea-worn fragments below its edge.

3. *220 to 240 feet.* This bench and cliff are shown at The Cleft where the caves and a "chimney rock" or "tilting rock," a stack detached by wave action are conspicuous features. (Fig. 3.)

4. *270 to 290 feet.* This bench and cliff are best seen on the east face of Gorham Mountain, where the well known Cardillac cliffs and sea cave mark this level (Figs. 7 and 8), and on the east face of the Beehive.

Well within the sea cave at the base of Cardillac Cliffs are spherical boulders of granite which look as if they had been wedged into their present position between joints in the granite by wave action. This, however, has not been their history. Disintegration, in place, of massive jointed rock will produce spherical boulders and this is the explanation of these boulders which are even yet not completely separated from the parent rock.

5. *300 to 340 feet.* A block of granite (7 feet by 4 feet), torn from its bed, turned over and lodged above its original bed, is a proof of sea-work at this level, and stratified clay, containing marine fossils, attest the presence of the sea for a considerable time.

6. *380 to 430 feet.* This bench is shown on the western face of the Triad.

7. *480 to 500 feet.* This bench is most conspicuous on the east flank of Jordan Mountain near the south end of Jordan Pond where there is a distinct undercut cliff.

8. At 550 feet and upwards there was a series of cliffs scarcely separated by distinct benches. These cliffs, forming the precipitous sides of Pemetic, Jordan, and Newport Mountains, are without much doubt due in a large measure to wave action.

Above 1,000 feet there are still some evidences of sea action. They are not very well defined as would naturally be the case with smooth rock gently inclined, and exposed, perhaps, to the action of the sea for a relatively short time.

On Jordan Mountain for instance, there is between 1,140 and 1,160 feet a strong bench surrounding the mountain, which means that this summit was once an island among a small group of sea-washed isles.

Pemetic Mountain shows within 30 feet of the top distinct benching with low cliffs. Chasms, due to the erosion of dikes, with walls too steep and too sharply defined to have been produced by glacial action, are one of the features of the summit of Pemetic Mountain which indicates sea action. These chasms trend nearly north and south, are from 20 to 40 feet wide, and 20 or more feet deep.

The deep gorge between Sargent and Jordan mountain shows excavation by wave action in the lower 100 feet, which is in striking contrast to the rounded ice-worn upper portion of the gorge. Wave worn debris in this gorge and in the chasms are also witnesses of the presence of the sea, and the removal of glacial drift is strong corroborative evidence.

The question which naturally arises is, are these successive benches horizontal with reference to one another and to the present sea level? In other words, was the land-mass lifted successively *en bloc* to uniform heights or was it elevated with warping, bringing different portions to different heights?

A more detailed study of altitudes needs to be made before this question can be satisfactorily answered; it may be noted that the benches are, naturally, no more continuous than are the present benches now being developed at sea-level, and that in these old sea cliffs, as in the present sea cliffs, there is a range of 10 to 15 feet in the positions of the bases of the cliff and a still greater range in the heights of the cliff. These facts must be taken into consideration in the correlation of the benches.

History of Mount Desert.—In very early geologic time (pre-Cambrian and early Palæozoic) sedimentation on the American continental shelf was going on in the area now occupied by Mount Desert Island. Sand and clay were being delivered at the coast and sandstones and shales were being formed in the quiet depths of the sea. This sedimentation did not take place without interruptions of various kinds. Land movements brought the sediments above the sea, subjecting them to erosion and removal and later to submergence when other sediments were deposited upon their remnants. Subsequent movements of uplift were accompanied by volcanic outbursts; the pouring out of great lava flows and the ejection of finely divided fragmental material.

Sedimentation was followed by a period of mountain growth when the sandstones and shale already indurated and altered by contact with lavas and intrusive dikes were uplifted, folded, and intruded by the granitic magma which, buried beneath a great thickness of sediment, cooled in a dome-like mass. The compression, which folded the rocks, and contact with the hot granitic magma further altered the sandstones and shales converting them into quartzites, slates, flagstones, and schists.

The mountain-making period was followed by a long period of stability and erosion when not only the cover of the granite was removed, leaving merely the present peripheral remnants, but also the granite itself was deeply eroded and the whole area reduced nearly to a plain, sloping to the sea. This long quiescent period was closed by the uplift of this plain with southward tilting and the initiation of a period of renewed erosion.

To this later erosion interval belongs the formation of many parallel valleys. The runoff flowing south to the sea concentrated in channels developed because of greater ease of erosion. Such lines of least resistance were furnished, as has been pointed out, by joints and dikes. The sources of these streams were doubtless near the extreme northern side of the island, from which the land sloped continuously southward to the sea.

When the ice sheet flowed over the island, the present gentle north slope was developed by ice-erosion, the valleys on the present south slope were deepened and the lake-basins were carved. Upon the disappearance of the ice, pre-glacial drainage had been considerably modified. The northern headwater valleys had disappeared in the erosion of the northern slope and young post-glacial streams forced to make their own valley, developed shallow meandering courses on this gentle slope uninfluenced by rock structures, which were concealed under a mantle of drift. On the southern slope, post-glacial streams found ready-made, pre-glacial-stream-eroded, glacially-deepened valleys, heading in ice-eroded basins, and took possession of them, converting the basins into lakes.

Since glacial times, the south flowing streams have pushed their headwaters northward. Having the advantage over their rivals of a steeper descent to the sea and of older valleys, they are shifting the divide northward and in some cases have already captured the headwaters of the northward-flowing streams. Northeastern Branch has in this way been robbed of its headwaters, Aunt Bettys Pond, which now drains south through Somes Sound. Bubble Pond and Eagle Lake, on the other hand, have had their drainage reversed by a northward-flowing stream, possessing a shorter course to the sea than its southward rival.

Following upon glaciation came the submergence of the island; when perhaps the summits of even the highest peaks were below the sea or when the sea reached at least the present 1,300 foot contour line. Mount Desert was not long completely submerged, but soon began to emerge from the sea by a succession of uplifts and halts of varying duration.

At certain levels, such as have been indicated, the island remained stationary for periods of time sufficiently long to produce coast features as well defined as those marking the present coast line. The pauses were longer at the lower levels and the pause at the present level may have lasted several thousand years. It is improbable that the present seashore marks the highest uplift of the island: lower levels have doubtless been submerged.

That all these movements have taken place quietly, that is without violent earthquake shocks, must be inferred from the number of poised and balanced rocks, which are found on the island and which could not have maintained their delicate adjustment if Mount Desert had been subjected to earthquake shocks.

Recent coast-building is found in the development of a sand bar barrier extending across Bracy Cove and enclosing a lagoon known as Long Pond; in the formation of a bar (tombolo) tying Bar Island to Mount Desert and giving the name to Bar Harbor, and in the growth of beaches in the cove heads. The coast is notable on the whole, however, for a feeble development of spits, hooks, bars, loops, beaches, and similar coast features; a phenomena which is owing to the relatively brief time during which sea and streams have been cooperating in the accumulation and deposit of shore material.

Some 5,000 acres of the most beautiful portion of this superb island has recently been made a national park. This domain, given to the nation for the perpetual benefit and enjoyment of the public through the patriotism and generosity of private owners, lies between Bar Harbor and Seal Harbor in a north-south direction and between Northeast Harbor and Schooner Head in an east-west direction.

It is a commanding highland area, undisturbed in its natural beauty, surrounded by a summer population from all the United States on the coastal lowlands, and including within its boundaries no less than five lakes and eleven mountains. The lakes are: Sargent Mountain Pond, Jordan Pond, Eagle Lake, Bubble Pond, and the Bowl. The mountains are: the White Cap (925 feet), Green Mountain (1,532 feet), Dry Mountain (1,268 feet), Picket Mountain (720 feet), Newport Mountain (1,260 feet), the Beehive (560 feet), Pemetic Mountain (1,262 feet), the Triad (688 feet, 720 feet, and 600 feet), Jordan Mountain (1,180 feet), the Bubbles (845 feet, and 780 feet), and Sargent Mountain (1,344 feet).

This new public domain is to be known as the Lafayette National Park. It is notable in being the only national park located east of the Mississippi river, and in its name it perpetuates anew the memory of the gallant Frenchman whose services to our country have been especially recalled in recent years. The appropriateness of the designation is emphasized, when we recall that the island was first explored by a compatriot of Lafayette—Samuel de Champlain, who visited it over three centuries ago, landing at Bar Harbor September 5, 1604, and gave the island the name it still bears.

BRYN MAWR COLLEGE,
September, 1919.

GEOGRAPHIC FACTORS IN THE ECONOMIC PROGRESS OF THE SOUTH.

George D. Hubbard,

Oberlin College, Oberlin, Ohio.

Today the south is rapidly coming to the front. It is leaving behind the old south wrapped in a leisurely indifference and is facing present problems with an alertness equal to that of the north. One of the important factors in its past apathy has been a lack of knowledge of the varied resources of the southern states,—minerals, forest products, and other raw materials, and of the power to convert them.

So well, however, have the soils and climate of the south been known that the agricultural and horticultural possibilities of this section have received much attention. It has even been said that these states are good only for cotton, sugar, fruit, and tobacco raising.

Without discounting this well-founded faith in southern agriculture, both as to its present attainments and as to its future promises, it may be well to consider other geographic influences that are working to push the south to the front. But I cannot willingly or wisely turn from the soil without adding a paragraph in that connection.

Most of the south land is capable of agriculture. More to the point now, are the millions of acres redeemable but not yet fully redeemed. In the Mississippi flood plain and delta are nearly 10,000,000 acres of the richest tillable land in our public domain. That alluvial valleys are eminently fertile is abundantly established by a study of the prodigality of those of the Nile, Indus, Ganges, Tigris and Euphrates, Po, Hoang Ho and Yangtse Kiang. That such valleys can be made to produce and in comparative safety to their occupants, is equally well confirmed by the use made of similar flood and delta plains in Holland and Belgium and by man's engineering achievements on many of the river plains enumerated above. American ingenuity can and must master the Mississippi River and put its plains at the disposal of the food producers of the nation.

Probably an equal area of rich lands is yet unproductive along the coasts and the smaller rivers. The Everglades or "continuous openings" as the word means, are very fertile areas in southern Florida. Engineers are draining these acres by cutting many canals and open ditches. Astounding crops are raised on land already so recovered from the marshes. Other coast lands only recently (geographically speaking) in a swampy or even lagoon stage are now recoverable. These opportunities, of a purely geographic nature, are calling for a chance to be used in feeding the world's millions.

The south, particularly that part known as the "old south," has a climate free from many of the rigors of winter. Some parts are even free from frosts. Precipitation is ample. No wonder that the agricultural possibilities of these States should already have been recognized.

But to direct attention to the resources and other geographic factors in the problem of the south's awakening, it may be well to notice the mineral wealth, both metallic, and non-metallic, to recall the fuel reserves, and the hydraulic power possibilities and recognize the importance to industry, of the climatic conditions.

Take for example, the white metal aluminum now so much desired and used. Our own south now furnishes 55 per cent. of the world's aluminum ore. That ore is Bauxite, a complex hydrate of the metal, or better, a mixture of several hydrates and hydrosilicates. It is found in large quantities in Georgia, Alabama, Arkansas and Tennessee. No northern state produces, or is known to possess, considerable quantities of this metal. But just beyond the southern states, the Guianas and Venezuela in South America, and Cuba in the West Indies, contain extensive reserves. This gives the South a peculiar preëminence in the aluminum world.

While the metal itself is much used, it is possible that the alloys of aluminum with various other metals, will furnish the largest use for this product. Aluminum alloys with almost all metals of the industries and some of its compounds are justly famous for their tensile strength, others for their hardness, and still others for their non-corrosiveness. All are, of course, light. These products are used in many machine parts,—automobiles, bicycles, ships and aircraft. Aluminum is used not only in the metallic state but in combination with carbon, silicon and other elements in the making of abrasives. Exolon, Alundum, Lionite, Natite and Aloxite are some well known trade names of such substances. They are made into wheels, sticks, blades and various other shapes and are used for grinding and shaping armor-plate, auto and aero parts, in shaping shrapnell and high explosive shells, in grinding and forming rifles and bayonets and preparing cooking utensils. Every household has its wheel or stick for sharpening knives.

Aluminum is separated from its ores in electrical furnaces and made into its alloys and compounds under the influence of the electric current. Great quantities of steady power are necessary for its manufacture. This is where the south is particularly fortunate. Streams are perennial and of much more constant flow than those in the north. Floods and low water do not reach such wide extremes. In general, precipitation is more copious and there is little or no frozen season. There is plenty of fall in the streams in southeastern United States. These factors mean water power is abundant and steady, all day, everyday, all the year round,—the ideal power for electric processes. The Tennessee river alone is competent to furnish 1,000,000 horse power. This would supply twice as much electrochemical and electrometallurgical power as Niagara supplies today. Of course, it is not all in one place as is Niagara's; but by means of wire transmission it could be brought cheaply into four or five centers. Alabama has 1,600 miles of navigable streams with immense water power. Some one should develop this power and have it ready to aid in the location of new plants in the aluminum and other industries. Some war industries would have gone south but for the lack of developed power. After-the-war industries will spread to the southern states if they are ready.

The south, particularly Alabama and Tennessee, produces much iron. Missouri has no mean iron supply. Recent statistics indicate that these states furnish about one eighth of the iron ore now mined in the country. The south is said to have half the iron reserves of the United States. Exploration has perhaps not demonstrated so large a proportion, but her deposits must not be far behind those of the Lake Superior region, and in general while more scattered are certainly nearer coal and limestone, two necessities for the reduction of the ore. The Southern Appalachians are one of the great iron repositories. This elevated region, too, is the center of the water-power reserves and with the growth of electric steel-making and the expansion of the use of steel and its alloys the iron industry in the south has marvelous possibilities for development even without using her coal.

The copper industry finds an important center in Tennessee. Its development is just begun and its future bids fair to be extremely important. Other southern states including Arizona produce at present nearly half of the total copper supply for the United States, whose mined product is now one half of the world's output.

Always important in the industrial world is the fuel problem. The South produces the same proportion of the nation's coal as of iron. She has magnificent reserves in many states,—Alabama, Arkansas, Kentucky, Tennessee, Oklahoma, Texas and Virginia. Perhaps just as important as coal, is the oil and gas production. Here nature seems to have been lavish with the south. In a recent year the United States produced nearly 300,000,000 barrels of oil, about 20 per cent. of which came from the north, while California and Oklahoma each claimed nearly a third of the total. In gas the proportion produced by north and south is practically reversed. Asphalt is scarcely known outside the southern states; while little used for fuel alone, it forms a considerable part of the western oils and is important as a binder in briqueting fine coals. The south has no shortage of fuels.

Quite significant also is the fact that her needs for fuels are proportionately low. In many southern cities factories need no heat all winter. Homes need much less than in the north. In many parts wood is abundant.

In the field of non-metallic minerals there is a varied and profligate supply. Cement materials, shales and limestones, are unlimited in many states. Their use has begun in Virginia, Georgia, Kansas, and Alabama. These states and many more, might well produce all the cements they need, and turn out more for export.

Inexhaustible supplies of clays, residual in the Appalachians and plateaus, and recently bedded in the Coastal Plain, exist and invite the manufacturer. Clays suitable for all rough work such as tiles, terra cotta, sewer pipes, drains, electrical supplies, brick and linings, jugs and crocks and plain pottery await development. In many ways the supply and variety compete with New Jersey, New York, Pennsylvania and Ohio; but the development is at present far below the output in these progressive states.

Salt and sulphur are both produced in the south. Louisiana is the best supplied of all southern states: and she is already the leading producer. Her output equals one tenth of the salt and perhaps one half the sulphur in the United States. Of sulphur she has over large areas, great beds 100 feet thick. In these days of such large use of sulphur and sulphuric acid these deposits should call for great development.

Another immense source of sulphur and its acid, is iron pyrite and the sulphide ores of copper, lead, and zinc. The south is well furnished with all of these and particularly with the first. These sulphur compounds are roasted and the sulphur oxidized and driven to condensing chambers after which it is readily converted into sulphuric acid. At present, tons of sulphur are lost and wasted annually by turning these fumes loose over the land, much to the detriment of vegetation.

In phosphates the south has almost a natural monopoly. Late statistics show Florida, South Carolina and Tennessee producing together over 2,700,000 tons, while all other states of the union produced but 5,000 tons in the year. This is not all the advantage accruing to the south in the phosphate industry. The native rock supply comes from the same region that is rich in pyrite. Pyrite is roasted to make sulphuric acid, and phosphate rock can only be made available for fertilizer by treatment with this acid. Coal to roast the pyrite, pyrite to be roasted and phosphate to be treated all are often found in close proximity; and the poorer well-worn soils of Virginia and southward demanding phosphate fertilizer, constitute a rare combination for the building up of a large industry. We have been so thriftless in the past as to send our pyrite to England to be made into acid, and our phosphate rock to be treated; and then have generously purchased the fertilizers from the English manufacturers, but we are learning.

Alabama produces one half of all graphite mined in the United States and has great reserves. At present this product is mostly manufactured in the north.

Georgia produces one half the ochers and mineral paint pigments found in the country. The south undisturbed by glaciers, has great depth of residual soils, ochers, and decayed rock far surpassing any northern states.

Manganese used extensively and increasingly in the manufacture of hard alloys for tools, safes and other purposes, is found in Georgia, Virginia and Arkansas. Our whole American production comes mainly from these three states. Chromium similarly used is abundant in North Carolina and Georgia.

A mark of a country's civilization is its architecture. Both its style and its materials are significant. The South has been shown to have cement for concrete construction and clays for brick and tile. She also has stone in profusion and variety, with which she can erect her palaces of industry, ware houses, offices, public and private buildings. Georgia has no superior in the matter of granite and marble. Tennessee has a wide range of high grade marbles, and Virginia has all kinds of limestone. Every state has its sandstones and limestones except Florida and Louisiana. They can buy from any coast state and import by water to their very doors. The building problem is also facilitated by the abundance of forest and lumber, and the mild climate.

Labor is always an important factor in industry. The South is already well populated and thus has abundance of labor both unskilled and skilled. In a land agriculturally so resourceful, labor is easily fed. It has been shown that the housing is not a difficult matter. Living is no hardship where the climate is warm most of the year and never severe. Clothing of the people is likewise an easy problem. No heavy clothing and bedding are needed. Even a coat is unnecessary for a workman's suit during half the year.

These southern states are further favored in their geographic environment in having a good local market for many of their products, and adequate transportational systems to move the surplus both northward and overseas.

The war market has given a strong stimulus to southern industry and any increment of growth now attained will not be lost when peace times arrive. The South is awakening to the value and advantage of her geographic position, resources, and opportunities. Northern capital has begun to flow thither in a larger stream. Federal and State governments are encouraging southern development. To-day the South does not need to borrow capital as she has done for two generations.

The conditions point to several centers as the natural nuclei of this industrial aggressiveness.

Beyond all reasonable doubt the Southern Appalachians will be one of these centers. Southern Germany and the mountains of Great Britain offer no more favorable places for great industrial activity than does this region. Our mountains are simply one or two generations behind those overseas.

Eastern Oklahoma has marvelous opportunities for a substantial center, and in spite of her somewhat artificial, oil-induced enthusiasm, should come to take her place in the industrial world. It is not improbable that the portions of Missouri and Arkansas bordering on the highway of the Mississippi River, with its graded plain and water transportation, should follow more slowly but possibly just as securely the way of the Lake plains in Northern Ohio and Pennsylvania. One can scarcely prophesy where America's new centers of industrial activity are to be located, any more than one could have foreseen a hundred years ago, where the industrial centers of Europe were to find their home.

But our civilian duty requires some of us at least to look these problems in the face and begin to prepare for them.

HISTORIC NOTES RELATING TO NEW CASTLE, DELAWARE.[1]

RICHARD S. RODNEY.

I had intended to speak a few words without notes to-day, but last evening I realized as never before, that he who speaks of history must needs be accurate; that he who hands down tradition must avoid all error and I hope I may be pardoned for committing a few scattered notes, hurriedly prepared, to writing.

We welcome you sincerely here to-day and if, perchance, you see anything that interests or pleases you, or if by happy accident some unknown fact is here made plain or some forgotten incident is brought to light, we are doubly thankful for your visit.

Let all of geographical turn of mind remember that New Castle has had more names than any other town in the United States. Sandhuken, New Amstel, Grape Vine Point, New Stockholm, Delaware Town, Fort Casimir and New Castle it has been variously called. Of owners too the whole gamut has been run—Indians, Dutch, Swedes, Dutch and English have in turn settled for the time its ever-changing destinies. But it is not of general history I would speak, but of a few of the things you will see. Volumes might be written of the recorded events and the traditionary anecdotes, that make the atmosphere of such a place as this.

You must remember then, that New Castle as an important place, long antedates Philadelphia. For here a fort was built—here a law was passed which compelled every ship to stop and pay duty before going to the Quaker City. From this very place, Governor Evans, during his memorable fight with the peace-loving Friends in council, persuaded John French—then Sheriff—to ride to Philadelphia with the tale that privateers had burnt Lewes and destroyed New Castle and were about to attack Philadelphia. No lesser authorities than Samuel Preston and James Logan testify that the consternation produced by this news was great—that people fainted—threw valuables into wells and indeed the New Castle Hoax was remembered for many a day.

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[1] Address delivered on the occasion of a visit of members of the Society to New Castle on September 27, 1919.

A few of the places to which I especially draw your attention during the afternoon are:

1. Immanuel Church, the history of which, I understand, will be particularly given by the Rector who himself was formerly one of your fellow townsmen.

2. Adjoining the Church on either side, are school buildings (now much criticized). One was built for an Academy about 1802 and the other by the United States as an Arsenal about 1809. The square on which they are erected is worthy of a moments thought by you. It is supposed, that it was laid out by Petrus Stuyvesant who was here in person. After the conquest by the English it assumed an English air, with the Church on one corner—the courthouse and jail on the other. Here in the old days quarterly fairs were held. Here were held in plain view public whippings and hangings and here, in 1731, Catherine Bevan for the murder of her husband was ordered to be burned. She was to be strangled over the fire; but a jet of flame burning the rope, she fell into the flames, where, as the report goes, "she was seen to struggle."

3. On the Green is the old Courthouse, and while its interior is not handsome—neither mahogany nor white paint adorning its historic walls, it is to me the most interesting building in America. I believe it can be stated with no fear of successful contradiction, that it is the oldest public building in America. Independence Hall and Faneuil Hall were both erected years after it had been long fulfilling its functions. One wing is said to have been standing when William Penn arrived, and it is recorded that he stayed on his boat off the Town until the next day, October 28, 1682, when at this building, he received from Ephram Herman and John Moll the "turf and twig and water and soils of the River Delaware" as token of his jurisdiction of land, timber and waters. Here Pennsylvania legislators came and sat when there was union between Pennsylvania and the Three Lower Counties. James Logan and William Penn were frequent visitors, and Penn laid off 1,000 acres of land for a common for the inhabitants of the Town which we still hold intact. If the resounding walls of this old building could but speak, what tales it could tell —fervid oratory—pleading for the lives of men or arguing over

subtle distinctions of the law—for here was the seat of justice from the beginning of American History until 1882; heated political discussions—for here was the seat of Government from almost the days of the Dutch until after the Revolution; religious controversy—for here at times almost all sects have held their services.

In this Court House Judge Chase, of the United States Supreme Court, furnished one of the grounds for his subsequent impeachment by Congress. Time alone fails—not material nor the will to tell its glorious history.

From this Court House the famous twelve-mile circle was run, which circle forms the northern boundary of Delaware and was the tangent definitely locating the Mason and Dixon line. Enoch Anderson in his diary says he marched his Company from Wilmington and took from the Court House at New Castle the "baubles of Royalty" and burned them on the Street in front. What a picture this brings to mind—were these objects portraits of the sovereigns or other interesting "baubles of Royalty" which fell a prey to our young, valiant but hot-blooded republican.

Near the Court House is the home now of David Boulden. Here Lafayette in 1824 attended the wedding of the daughter of Senator Van Dyke to Charles I. du Pont, and, it is said, all blinds were opened, all curtains raised so that he who passed might see and I doubt if New Castle that night had many who did not pass.

Across from this is the house built by Chancellor Johns. It has little history, but is a pure type of the period immediately succeeding the colonial days.

Chancellor Johns married a Miss Van Dyke (a daughter of Governor Van Dyke) in the house now owned by Mr. and Mrs. Henry Hanby Hay. This house is one of our oldest now standing and at this wedding no less a personage than Washington himself attended. Indeed his journal shows him, while not a frequent visitor, yet not a stranger here.

The Strand (our Front Street) is rich in history and around it in the early days centered much of the social life. Near this building stands the large and imposing home of the late Miss Hetty Smith. This house was built by George Read, Second, First U. S. District Attorney after the Adoption of the Federal Constitution. He was a son of George Read, the Signer of the Declaration of Independence, whose house stood in the garden adjoining it and but a few feet away. The great fire of 1824 destroyed this house and a large part of the Strand. A few doors further up is the house built by Governor Bedford, now owned by Alexander B. Cooper, Esq., to whom the local history of New Castle is a familiar and fascinating labor of love. This was for years the home of the Farmers Bank.

A few doors on, at the corner of Delaware and the Strand, stands the home of Miss Postles. Here during the Revolution lived Mr. Van Leuvaneigh, and, when at Lexington was fired the "shot heard round the world," the news came by messenger on horseback and at every town a good citizen received and receipted for the message and sent the bearer on. In New Castle Van Leuvaneigh had the honor to act for his fellow-townsmen in this capacity.

On the Market Square you will see a monument made of blocks of stones. This was erected to preserve in some enduring fashion a reminder of the New Castle and Frenchtown Railroad. The main line of travel from Philadelphia to Baltimore, Washington and the South, came through New Castle then—passengers coming from Philadelphia by boat, were taken over this Railroad to Frenchtown on the Elk River, where a boat took them to Baltimore. Iron straps on wooden sleepers, bolted to these stone ties, made possible what is described in a letter in the possession of the speaker "of the excessive and dangerous speed of ten miles an hour." A man always preceded the engines in Town. From this humble beginning our present railroad system has grown and future members of the Geographical Society may smile at the crude methods of to-day, as we do at those of the past.

Near the Church you will find in the house of Miss Janvier some silver and furniture of Lydia Darragh, especially interesting to Philadelphians. Also portraits of two of her children. Our minds easily slip back to that winter night in 1777, when, at the house of Lydia Darragh on South Second Street, the British Adjutant unknowingly dropped the secret of the attack at White Marsh, and it needs no stretch of the imagination to picture the same Lydia starting the next morning on her hurried jaunt for flour, whispering the alarm to Major Craig. The personal touch brings these things to life.

A few doors from Miss Janvier's residence stands an old hip-roofed Dutch house—probably the oldest here but its history—traditions—anecdotes have, like its builders, passed from the knowledge of men.

The home of Mrs. John H. Rodney itself has little of historical value; but it holds much within its walls. Particular attention will be directed to the original portraits of two Signers of the Declaration of Independence: George Read of Delaware and his brother-in-law George Ross, born in New Castle, but a Signer from Pennsylvania. Here are possessions of Cæsar Rodney, who, with George Read, almost reigned supreme in Delaware during the days of our ever-glorious war of Independence—"the days that tried men's souls."

I could prolong indefinitely what is to me a pleasant occupation. I could show that directly across the street from here lived Governor Francis Lovelace. I could show and prove that George Fox, the great Founder of the Society of Friends, came here in September, 1672, and, to use his words, "the Governor came into the Street and invited me to his house and afterwards desired me to lodge there, telling me he had a bed for me, and I should be welcome" and that they held a public meeting in the house to which most of the townspeople came.

I could continue—but if I did you will have heard but not seen.

Reference could be made to the interesting citizens who have lived here and to the illustrious ones who have walked our streets even as you and I—of William Penn, of Washington, Lafayette, Louis Napoleon, Andrew Jackson, Daniel Webster, Henry Clay, John C. Calhoun, Lord Ashburton, Sam Houston, Stonewall Jackson, Osceola and Black Hawk, but these are memories that will be handed down to succeeding generations together with the names of those who honor us here to-day.

BOOK REVIEWS.

Chamberlain, Allen. *Vacation Tramps in New England Highlands.* Pp. 164, illustrations. Boston and New York, Houghton Mifflin Co. 1919. Price $1.25 net.

Sometimes we think that the desire to go afoot is rapidly becoming lost in this era of trolley-car, railroad-train, automobile, motorcycle, and airplane. Then some delightful book such as Mr. Chamberlain's appears to tell us that there still are human beings who walk for pleasure, and not alone of necessity; that it is not how many miles we travel, but how much we see, that counts.

This book is small, as befits a tramper's volume, but between its covers are good writing and much information. At the beginning there is a discourse upon the hiker's outfit. Following this comes a group of worth-while chapters on the trails of the White Mountains and the Green. A "de luxe" two weeks' trip in summer over the Presidential Range is described, and a midwinter snowshoe climb of Mount Washington, but the novelty of the book lies chiefly in its account of the Green Mountain paths.

The Green Mountain Club is young, having been organized in 1910, but it has planned a Sky-Line Trail three hundred miles long, cresting the backbone of Vermont, and over half of this has been constructed. Much of the country opened up by this trail and its side paths is so new that its heights have never been officially named. It is enticing territory for the lover of mountains.

Kette-Adene, the preëminent, otherwise Mount Ktaadn or Katahdin, has a well-deserved chapter to itself. It is still one of the most inaccessible of our Eastern heights, being twenty-five miles from the nearest railroad. "The most imposing mountain east of the Rockies," Mr. Chamberlain enthusiastically, but doubtless truly, calls it, and his description makes one wish to attack the hard journey to its summit.

As a sop, perhaps, to those who can never hope to stand on Ktaadn, the book ends with a pleasant little "talk" on "Stage Journeys." These furnish new possibilities to the seeker of beautiful scenery. For the sake of those whose tramping power is limited, but whose appreciation of nature's gifts is large, let us hope that Mr. Chamberlain will soon give the public another book whose theme shall be these easy and charming travels by stage.

WALTER LEFFERTS.

Stephenson, William B., Jr. *The Land of Tomorrow.* 240 pp., illustrations. New York, George H. Doran Company, 1919. Price $2.00 net.

At first taste of the author's somewhat inflated style, one might conclude that caution would be necessary in dealing with this book. Such a feeling, if present in the reader's mind, will soon disappear in the genuine interest of

Mr. Stephenson's pages. "The Land of Tomorrow" is Alaska. Five years of residence on the island of St. Michael, sixty miles north of the mouth of the Yukon, together with journeys to almost every part of the country, have qualified the author for accurate and colorful description.

The United States is already sensible to the importance of Alaska, and this volume will stimulate public interest. The facts given are up-to-date and in many cases surprising. The Mount McKinley National Park, created in 1917, is described, though it is still undeveloped for tourists. The Government railroad to Fairbanks comes in for its share of notice, and the annoying red tape which has clogged the development of Alaska is well stated. There is an account of Mount Katmai, the greatest volcano in the world.

We learn that the richest mines in Alaska are not of gold, but of copper, that the only tin mines of the United States are in "The Land of Tomorrow," that the reindeer, the beef cattle of Alaska, now number a hundred thousand and are rapidly increasing. Naturally, the salmon fisheries are not omitted from consideration, but the author oversteps the mark when he states "The fisheries of Alaska cannot fail." Man's rapacity has already greatly diminished the salmon catch of the Columbia River, and, if not prevented, will in a short time do the same with regard to the Alaskan streams.

The book gives proof of research on the part of the writer. However, there is evidence of hasty writing, a lack of perception of the value of arrangement of subject-matter, and a failure to discriminate between the important and the unimportant, the enthusiasm shown and the interesting character of the material presented amply compensate for such literary defects. Mr. Stephenson has produced a book which is well worth the attention of every American.

WALTER LEFFERTS.

Harper, Lillie DuPuy Van Culin. *Colonial Men and Times,* containing the Journal of Colonel Daniel Trabue, etc. Philadelphia, 1915. 4to, pp. 624.

In the above work, Mrs. Harper has made a real contribution to American history. The Journal of Colonel Daniel Trabue, now first published, sheds light on a romantic period of our history and the wealth of genealogical data relating to the Trabue, DuPuy, Beaufort and allied families has been compiled with scrupulous care. Excellent illustrations and armorial bearings add to the value of the work.

GEOGRAPHIC NEWS AND NOTES.

Prof. George B. Roorbach, late Professor of Commercial Geography at the University of Pennsylvania, has been appointed to the newly-instituted chair of Foreign Trade at Harvard University.

Mr. Herbert W. Gleason, of Boston, has recently been appointed Inspector of National Parks.

Major Douglas Johnson, professor of Physiography at Columbia University, has returned from Paris where he served as chief of the Division of Boundary Geography on the American Commission to Negotiate Peace, and as a member of different international territorial commissions.

The American Museum of Natural History observed Roosevelt Day—October 27—by holding a meeting on the evening of that date in the auditorium of the museum. Under the theme of Roosevelt the Naturalist, the following friends and associates of the former President contributed reminiscences: Henry Fairfield Osborn, Carl E. Akeley, Frank M. Chapman, George K. Cherrie, T. Gilbert Pearson and Ernest Thompson Seton.

Among the manifestations of increased cordiality among the nations associated in the Great War is the addition by the French Alpine Club, at its general meeting of May 4th, of honorary members representing England, Italy and the United States. . . . In the honors thus conferred, three representatives of America—Messrs. Fay, Bryant and Montagnier are by different titles members of this Club.—*Bull. Appalachian Mt. Club.*

Under date of Oct. 20, a cable message from Naples announces: The duke of the Abruzzi and his party, who will make an effort to discover the sources of the Webi Shebeli river, which flows from Abyssinia through Italian Somaliland into the Indian ocean, have left there for Mogadischo.

ACTIVITIES OF THE SOCIETY.

ANOTHER DRIFT-CASK MESSAGE RECEIVED.

After a long interval, another drift-cask message has been forwarded to the Society. The message referred to was contained in a cask set adrift by Capt. B. T. Tilton, of the steam whaler *Alexander,* when that vessel was off Cape Bathurst (Lat. 70° 47′ N., Long. 126° 03′ W.) on August 18, 1899. The message was accompanied by a letter from New York City, dated September 19, 1919, from Sargeant P. R. Conway of the Royal North West Mounted Police. The entry on the message shows that it was recovered "on a small island on the south shore of Franklin Bay" by David Pictogane, an Eskimo of Baillic Island, on June 18, 1918. In the accompanying letter Sergeant Conway states that the Eskimo was employed by him as interpreter and mentions further that "the cask was in good condition when found on shore amongst the ice."

Of the thirty-five drift casks which were launched in the arctic waters north of Alaska and British North America in 1899–1900 six have now been heard from. Two of the casks made remarkable journeys of over two thousand miles and were picked up (*a*) on the most northern cape of Iceland and (*b*) on Soro Island, south of Hemmerfest, Norway. The other three messages heretofore recovered, were evidently subjected to local currents and were picked up at comparatively nearby points on the Siberian coast and elsewhere. The message recently received belongs also to this category; for, an examination of U. S. Hydrographic chart No. 2560 discloses the fact that in the nineteen years which elapsed between the launching and recovery of the message, it travelled almost due south—a distance of only about seventy-five miles. The journey of this particular cask, therefore, will add little to our knowledge of arctic drift currents; but is interesting as showing the ability of these stout, spindle-shaped, oaken casks to withstand the ravages of time in an arctic environment through a long series of years. This resisting power of the casks encourages the belief that other messages, which may perhaps have made more extensive journeys, may still be recovered.

GEOGRAPHICAL STUDIES ON THE WESTERN, ITALIAN AND BALKAN FRONTS.

BY MAJOR DOUGLAS W. JOHNSON.

Major Douglas W. Johnson, Professor of Physiography in Columbia University, addressed the society on the evening of November 5 on the general topic of the relation of topography to modern warfare. Major Johnson, who was on General Pershing's staff, was intrusted with a confidential mission to study the geographical work of all the allied armies on the various fronts. With the aid of lantern views, the speaker illustrated the tactical value of elevated positions and showed why the contending forces fought so fiercely for their possession. Views of American positions in the Argonne and the St. Mihiel salient vividly illustrated the difficulties our forces met and overcome in the closing months of the war.

WILMINGTON AND NEWCASTLE EXCURSION, SATURDAY, SEPTEMBER 27, 1919.

Fortune favoring with ideal weather, the members and their guests, under the guidance of Mr. Henry Paul Busch, Chairman of the Excursion Committee, left Chestnut Street Wharf at 9 A.M. by boat for Wilmington. Through the courtesy of Mr. George F. Sproule, Secretary of the Board of Commissioners of Navigation, Port Captain Arthur H. Edwards was assigned to accompany the party to describe objects of interest along the river. The great development of industries along both shores was very impressive. This part of the trip afforded an excellent opportunity to see some of the important shipbuilding plants on the Delaware.

Arriving at Wilmington, the first landing place of the Swedes was pointed out, and the party then walked a short distance to Old Swedes Church where the Vicar, Rev. Robert Bell, spoke briefly of the chief events in the church's history, and pointed out various interesting features of the building and the churchyard. A special trolley was in waiting at the church which took the party to Newcastle. Upon arrival, the Parish house of Immanuel Church was found prepared for the convenience of members who had brought their lunch with them. These details had been very efficiently arranged by a committee of Newcastle ladies organized by Mrs. Francis deH. Janvier, who later acted as guides about the town.

After luncheon there was a short introductory address by Rev. Alban Richey, D.D., whose friendly help had made the excursion possible, followed by the reading of a paper by Richard S. Rodney, Esq., in which he related many interesting events in the early history of New Castle.[1] At this point began a rare treat. Newcastle's doors were open. From house to house the party went, finding hospitable welcome everywhere, enjoying an intimate view of charming houses and lovely gardens, where were found innumerable objects of beauty and interest.

Here Washington had been a guest, there Lafayette had honored a wedding with his presence. On that front door one night long ago the post rider had knocked to leave news of the battle of Lexington. Portraits, silverware, furniture, mirrors, a wonderful set of blue and white; for the connisseur and lover of these things every turn was a fresh delight. The way led past the Court House and Market House and finally to Immanuel Church, where the Rector, Rev. Joseph H. Earp, who had given generous help in the arrangements of the day, spoke of the spirit of Newcastle; which had certainly been exemplified in the passing hour; and which reflected the generous hospitality of our hosts.

CORRESPONDENCE.

May 15, 1919.

MONSIEUR DOCTEUR G. GRANDIDIER,
Secrétaire Géneral de la Société de Géographie,
Boulevard St. Germain, 184,
Paris, France.

My dear Dr. Grandidier: Thank you for your letter in regard to Madame Beuchat. I am enclosing an international money order along with a brief letter of explanation, expressing our pleasure in sharing with Mr. Stefansson in this slight token of esteem for a fellow-geographer.

We appreciate your coöperation in this matter and thank you in advance for transmitting our letter and money order to Madame Beuchat.

With congratulations on the great victory, as on a new era of peace for which the world will remain debtors to France for many years, I am, on behalf of the Geographical Society of Philadelphia,

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[1] Mr. Rodney's address is reproduced in full on another page of this issue.

Sincerely yours,
WILLIAM E. LINGELBACH,
President.

May 15, 1919.

MADAME V. E. BEUCHAT,
Viroflay, France.

My Dear Madame Beuchat: On behalf of the Geographical Society of Philadelphia I have the honor of transmitting to you the sum of four hundred francs, of which amount one hundred and fifty francs is contributed by Mr. Stefansson and two hundred and fifty francs by our Society. Mr. Stefansson was awarded the Elisha Kent Kane Gold Medal for notable work in the field of Geography by our Society, but before accepting, he stipulated that the medal be cast in bronze and that the value of the gold ordinarily used in the medal be given to you.

The sum is a small token of the esteem in which Mr. Stefansson held your late son, Monsieur Beuchat, his friend and scientific companion on his Arctic Expedition in 1914. We join him in the expression of condolence and of regret at the loss of a staunch friend and an able scientist.

On behalf of the Geographical Society, I am,

Respectfully yours,
WILLIAM E. LINGELBACH,
President.

PARIS, le 12 Juin, 1919.

TO THE PRESIDENT OF THE GEOGRAPHICAL
SOCIETY OF PHILADELPHIA.

M. WILLIAM E. LINGELBACH.

Dear Sir: I acknowledge receipt, with my heartiest thanks, of your kind letter and of the papers enclosed, which we hand over immediately to Madame Beuchat.

Please let me also tell you how proud and grateful we are of the last words of your letter. Peace will, no doubt, let us do splendid work, and here all of use hope and will do our best for it, hand in hand with America. Believe me, dear sir,

Sincerely Yours,
Le Secrétaire Géneral
de la Société de Géographie,
G. GRANDIDIER.

VIROFLAY, 24 Juni, 1919.

Monsieur le President: Hier, 23 Juni, j'ai reçu a'la poste de Viroflay, le Bon International de 400 francs envoyé a'la Societé de France par la Societé de Géographie de Philadelphie, et par Mr. Stefansson.

Je suis profondément émue de ces marques de sympathie, cette belle action honore la Societé, Mr. Stefansson et mon cher et regretté fils.

Je vous remercie, Monsieur tout particulierement pour la lettre si bienveillante que vous m'avez envoyee, ma perte est bien grande, et mes regrets sont bien amers, mon fils aurait eté pour Mr. Stefansson un dévoné et utile collaborateur, la science, un travailleur et moi, un bon fils!

Je vous prie, Monsieur, d'agreer mes sinceres remerciments et l'expression de ma vive gratitude.

J. E. BEUCHAT.

42 Av. Gaston Boisser,
Viroflay, S & Oise,
France.

What Membership in the Geographical Society Means

The Objects of the Society are to promote the science and study of geography, to assist in geographical exploration, to provide its members with a well-selected library of works on geography, to provide for lectures by prominent geographers, to enable the members to give each other the benefits derived by travel at home and abroad, and to publish a Bulletin containing carefully selected geographical literature.

The Meetings of the Society are monthly and bi-monthly. The monthly meetings held on the first Wednesday of each month from November to May, inclusive, are addressed by prominent geographers, and are intended to keep the members informed regarding the advance being made in the knowledge of the world and the science of geography. The bi-monthly meetings are held later in the month and are also addressed by lecturers of distinction.

The members of the Society meet each year for a subscription dinner. There are also occasional afternoon receptions held in the rooms of the Society, at which are shown special collections of photographs and other objects of geographic interest.

Excursions. In the spring and autumn a series of excursions is arranged by a committee appointed for that purpose. These afternoon walks or all-day outings to nearby places of scenic or historic interest have proven to be a most popular phase of the Society's activity.

The Library of the Society is well housed at the rooms of the Society, 400 Witherspoon Building, which are open each week day from 9:30 a. m. to 4:30 p. m. The collection is well catalogued and contains, in addition to works of travel and reference, a large number of American and foreign periodicals relating to geography and kindred subjects. For the benefit and information of prospective travellers, a set of guide books relating to various countries has been collected and is kept up to date.

The Publications of the Society consist of the BULLETIN OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA, a quarterly journal containing papers by geographers of high standing, reviews and notes on geographical literature, reports of geographic discovery, and an account of the activities of the Society. Both active and non-resident members receive the quarterly BULLETIN without extra charge.

Membership. Persons residing within twenty-five miles of Philadelphia may be elected to active or resident membership by the Board of Directors of the Society. The initiation fee at present is $5.00 and the annual dues are $5.00. Persons living more than twenty-five miles from Philadelphia may be elected to a non-resident membership. Non-resident members are not required to pay the initiation fee and their annual dues are $2.00. Any member or member-elect may become a life member by the payment of $100.00.

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